APRIL 1952
World Petroleum
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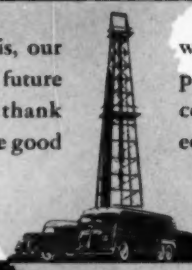
Tomorrow's Tools -Today!

20 Years of Progress

As we look ahead on this, our Twentieth Anniversary, to future decades of service, we thank our many customers whose good will and cooperation has made possible our steady growth and continuous improvement in equipment and service facilities.

Pioneer in Radioactivity Well Logging Service

Pioneer in Gun Perforating Service



LANE WELLS

TECHNICAL OILFIELD SERVICES

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela
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73 Locations to Serve Every Active Oil Area

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Unique

"Newallastic" bolts and studs have qualities which are absolutely unique. They have been tested by every known device, and have been proved to be stronger and more resistant to fatigue than bolts or studs made by the usual method.

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CALTEX
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OIL GOES TO WORK

—for transportation, agriculture and industry

Caltex sees to it that its quality fuels and lubricants are available — from many immediate and convenient sources of supply. This assures economical, on-schedule operations for 'most everything that moves on land and sea, on the farms, in the factories.
So *Caltex* contributes to national welfare, strength and security throughout the Eastern Hemisphere.

CALTEX

PETROLEUM PRODUCTS

WORLD PETROLEUM for April, 1952. Vol. 23, No. 4. April, 1952. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 West 45th St., New York 36, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies $1.00. Copyright, 1952 by Mona Palmer, Trustee.

We applied the "strip-tease" principle to dealer education

Oil company executives who have seen Ethyl's "Product Sales Clinic" say that it gives more real sales-building information than anything of its kind. This new show was developed to help you carry out your dealer-education program. Its purpose is to give service station personnel a working knowledge of engines, fuels, lubricants and TBA items.

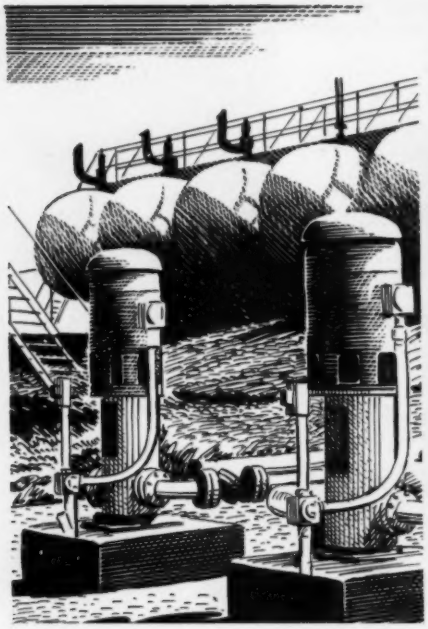
As you know, dealer education is at best a difficult and laborious task. Textbooks and pamphlets seldom get careful study, even though they are attractively illustrated and diagramed. And you know how during long meetings even the best of upholstered chairs get hard. Men start to fidget and wish themselves out.

We believe one solution to the dealer-education problem is "showmanship." So in our Clinic we employ basic theatre techniques, one of which is the "strip-tease" principle. Giant models of an engine, a carburetor and a distributor are stripped down to show the how and why of their operations.

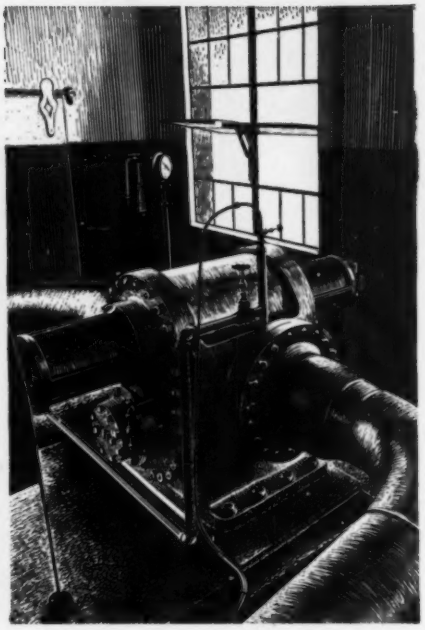
Other interest-holding ideas are an unusual use of black light and fluorescent paints . . . dramatic demonstrations of such subjects as knock and oil contamination . . . and a "talking" engine operated on various fuels while big dials tell the different stories of speed, power and heat.

Several units of the "Product Sales Clinic" are now working full time. And plans are being made to expand this service to meet the demands of the industry.

ETHYL CORPORATION . . . New York 17, New York



WORTHINGTON VERTICAL TURBINE PUMPS



WORTHINGTON ROTARY PUMPS

First choice for transfer service around the globe!

Here are two pumps used the world around for *oil transfer service*. Each bears the name that means *value*, value based on over 100 years' experience with liquid- and gas-handling equipment.

Vertical turbine pumps of the newest design available anywhere—a complete line with eight long-life features. Sizes 6 in. and up.

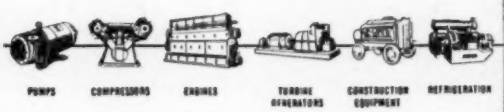
Rotary pumps, herringbone gear or sliding vane types, capacities from 1 to 5000 gpm; pressures to 500 psi. Widest choice available!

Worthington furnishes many other products for more efficient drilling, transfer, and refining of oil. Write for bulletins to Worthington Pump and Machinery Corporation, Export Department, Harrison, New Jersey, U. S. A.

WORTHINGTON'S "BIG 3" ENGINEERING SERVICE

1. Before you buy, Worthington gives valuable advice in the correct selection of equipment for each specific application. You benefit from Worthington's century of experience.
2. When you buy, Worthington engineers are available to supervise installation, advise operators and maintenance men and to see that equipment operates properly.
3. After you buy, Worthington provides competent service—engineering advice on new problems, quick availability of spare parts.

You can buy Worthington products manufactured at these plants in corresponding local currency: Argentina, Austria, Brazil, England, France, Germany, Italy, Mexico, Spain, U. S. A. F-2-32



WORTHINGTON

The Sign of Value Around the World

"I wonder what happened to me !", said Alice

ALICE in Wonderland ate the magic cake and grew until she was more than nine feet tall. Our National bureaucracy also seems to have partaken of the magic cake of power. Bureaus in our government have grown in number and scope until their activities now control, to a great extent, the lives of all individual Americans. Department after department adds more and more people -- state, justice, commerce, treasury -- not to mention those sprawling emergency born agencies of price control, N.P.A. and other alphabetical subdivisions.

The number of employees of our federal, state and local governments continues to grow. During many recent months, personnel was added to the federal payroll at the rate of 1,500 daily.

What is the reason for this mushrooming? The Korean War? Threat of war in Europe, Southeast Asia, or the Middle East? Obviously not! A glance at the federal budget gives the answer. The estimated cost of all governmental functions for the fiscal year 1952 is in excess of 70 billions of dollars, an increase of 26 billions, or approximately 60% more than last year.

When will it end? Only you, the individual citizen, who carries the bureaucratic load on his back, can stop it. It will end when enough patriotic men and women demand from congress that the Washington Wonderland start shrinking back to reasonable proportions.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

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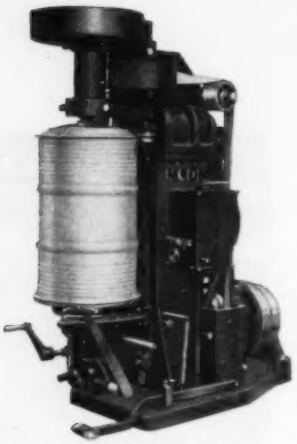
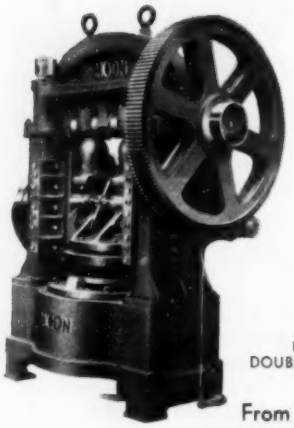
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

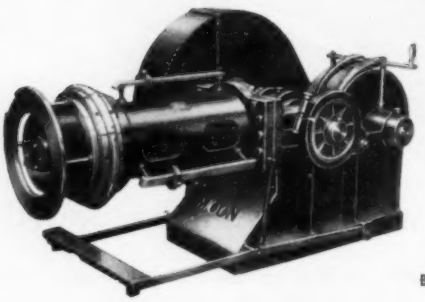
Count the minutes – count the Drums!



MODEL P.R.
DOUBLE SEAMER



MODEL V.P.
DOUBLE CRANK PRESS



MODEL P.K.
BEAD EXPANDER

From the sheet to the finished container involves as little as eleven operations; illustrated are three of the machines required—for forming ends, expanding beads and double seaming drum bodies. We can supply the complete plant according to your requirements and can advise you if any phase of your current production can be simplified. If you wish to speed up your output choose MOON machines—the complete plant averages a drum a minute.

MOON

Regd. Trade Mark

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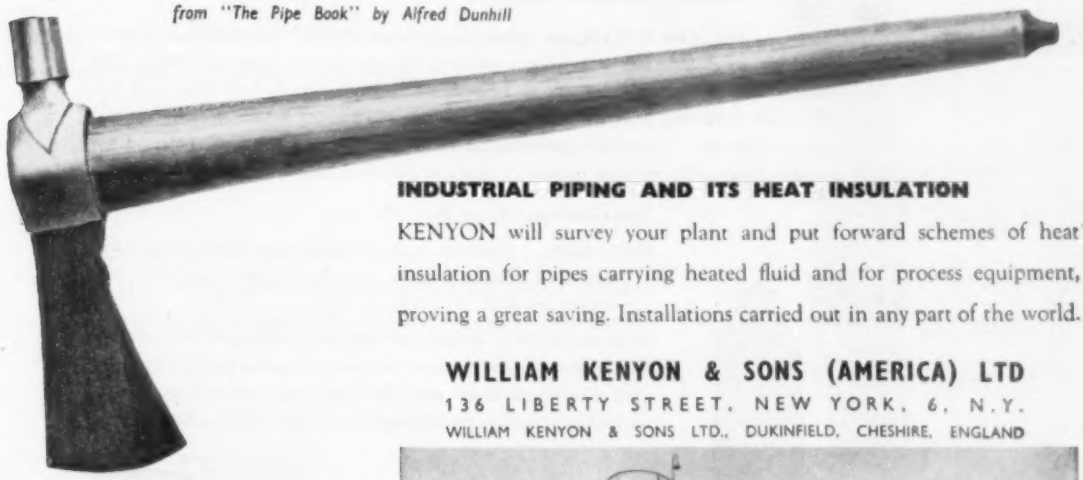
dm MB-47

PIPES with a difference...

TOMAHAWK PIPE

Since the Indian brave carried a tomahawk, it was not unnatural that this weapon should be made to serve also as a pipe in the ingenious manner shown in the illustration. But this device was most probably the work, in the first instance, of a European craftsman, for both English and French supplied the Indians with "trade" tomahawks of steel.

from "The Pipe Book" by Alfred Dunhill



INDUSTRIAL PIPING AND ITS HEAT INSULATION

KENYON will survey your plant and put forward schemes of heat insulation for pipes carrying heated fluid and for process equipment, proving a great saving. Installations carried out in any part of the world.

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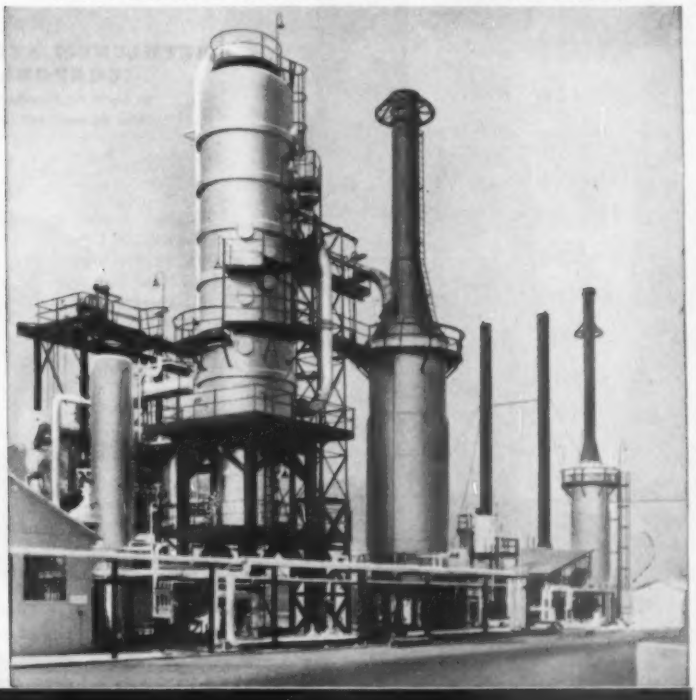


KENYON *Planned* HEAT INSULATION

You've Heard About Bethlehem's H-150 ...you're going to hear more!

Bethlehem's H-150, a pump for light rotary work, has been in the family for several months now. Long enough for almost everybody to hear about it. Long enough for drilling men to buy it and try it.

Out in the field, the only real proving grounds, the H-150 has done a swell job—for it's a sturdy, tough little unit with features reflecting the best in slush-pump engineering. Just take a look at these points: Complete oil-bath lubrication... pulley extension both sides... all-steel fluid end... API metal ring gaskets on valve covers, stuffing box housing flanges, discharge flanges, strainer housing flanges... telltale hole protecting fluid end from washouts if packing fails... alloy-steel gear made from rolled seamless forging... alloy-steel pinion... roller bearings throughout.

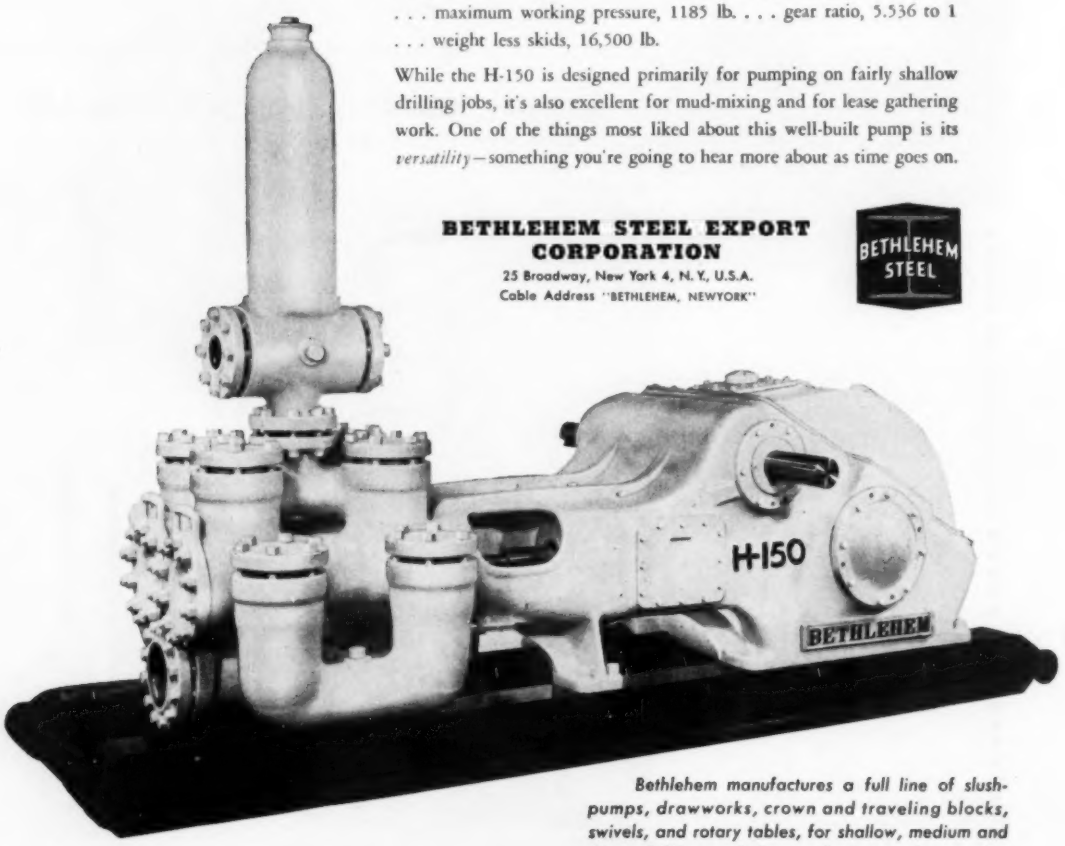
Specifications? Here they are:

Bore, 7¼ in. . . . stroke, 12 in. . . . maximum input bhp at 70 rpm, 191 . . . maximum working pressure, 1185 lb. . . . gear ratio, 5.536 to 1 . . . weight less skids, 16,500 lb.

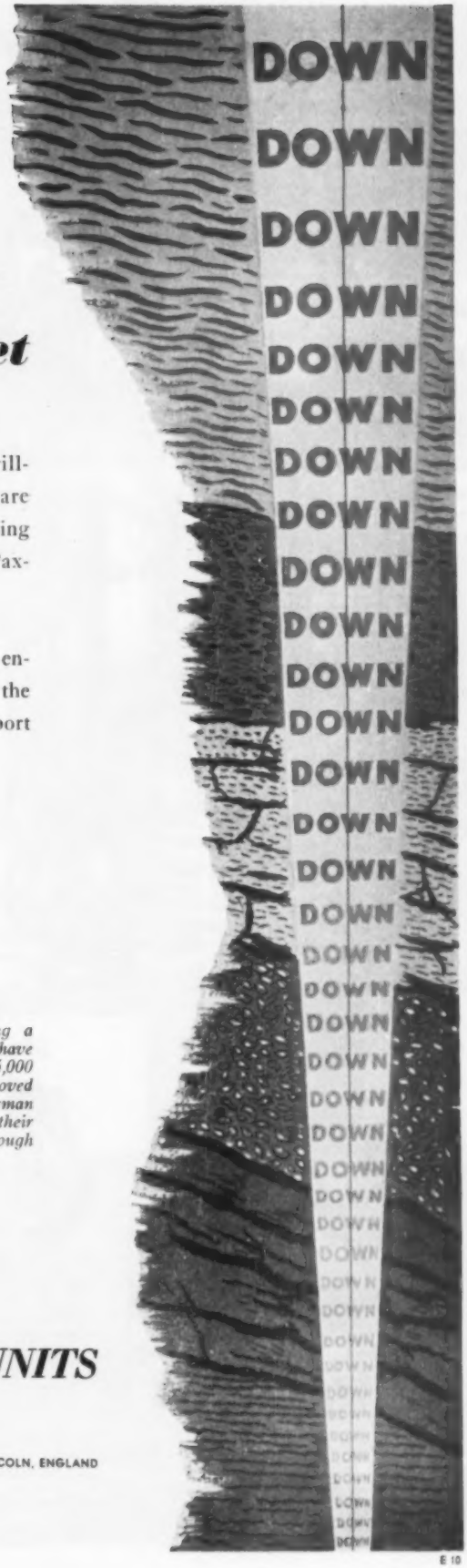
While the H-150 is designed primarily for pumping on fairly shallow drilling jobs, it's also excellent for mud-mixing and for lease gathering work. One of the things most liked about this well-built pump is its *versatility*—something you're going to hear more about as time goes on.

BETHLEHEM STEEL EXPORT CORPORATION
25 Broadway, New York 4, N. Y., U.S.A.
Cable Address "BETHLEHEM, NEWYORK"

BETHLEHEM STEEL



Bethlehem manufactures a full line of slush-pumps, drawworks, crown and traveling blocks, swivels, and rotary tables, for shallow, medium and deep drilling; and, for production work, pumping units in a wide range of sizes and types.


DOWN
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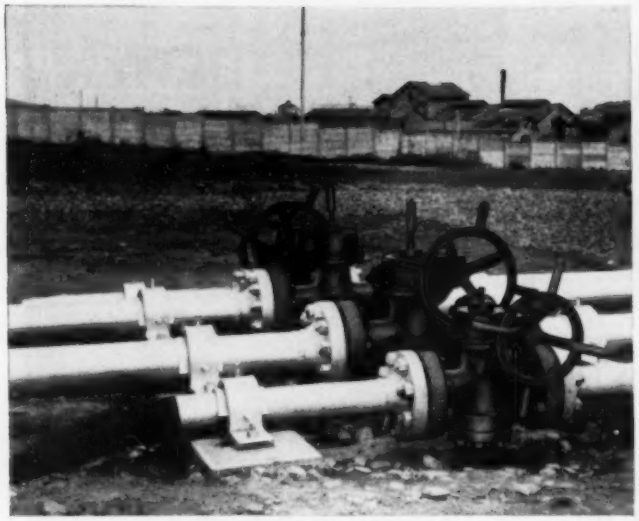
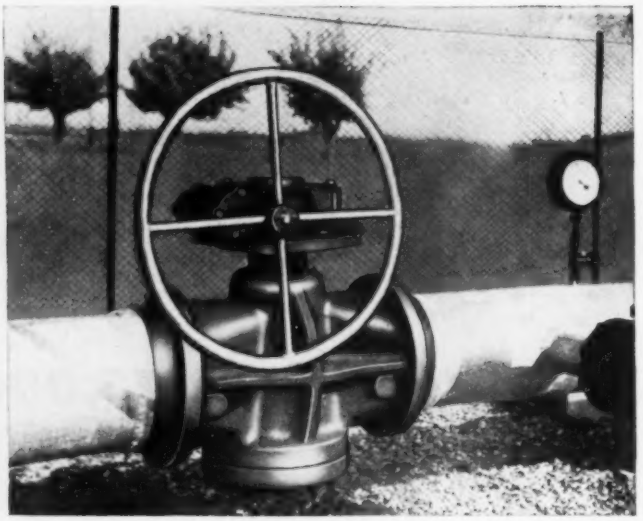


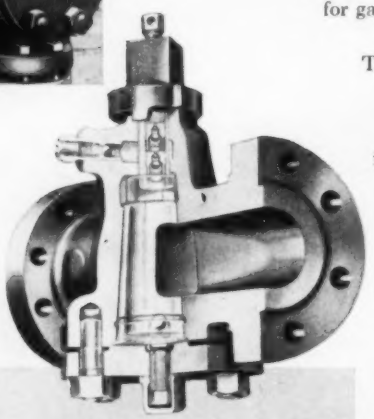


Wherever the World's Petroleum is found *there's work for* Audco-Nordstrom Valves

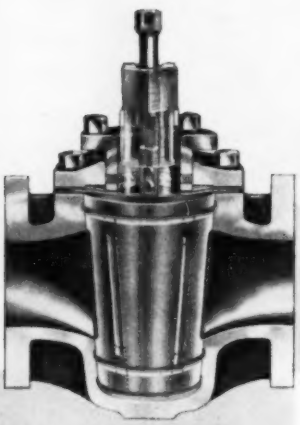
For drilling, production, refining, pipe line and distribution—for gas and petroleum in all its phases—there's an Audco-Nordstrom valve equal to the job.

The record of their success in world-wide installations over 30 years parallels the growth of modern petroleum technology. Being lubricant sealed, they are doubly tight. Hard-to-hold gases and fluids are perfectly controlled by Audco-Nordstroms.

A complete range of sizes, types and materials assures the proper valve for each specific service. Write for descriptive literature.



Hypreseal type Audco-Nordstrom valve for higher pressure services.



Standard bolted gland Audco-Nordstrom valve. Screwed gland in sizes 4" and smaller.

Audco-Nordstrom

BRITISH AMERICAN

Lubricant-Sealed Valves

ROCKWELL MANUFACTURING COMPANY
400 North Lexington Avenue
Pittsburgh 8, Pennsylvania

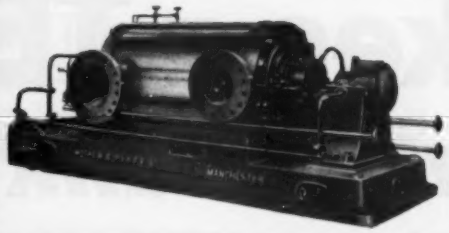
Export: International Division, Rockwell Manufacturing Co., 7701 Empire State Building, New York 1, N. Y.

Canadian Licensees: Peacock Bros., Montreal, Quebec.
AUDLEY ENGINEERING COMPANY, LTD.
Newport Shropshire, England

Overseas Agents located in South Africa, Australia, India, Trinidad, British West Africa, Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Roumania, Spain and Portugal.

Centrifugal Pumps & FLAMEPROOF MOTORS

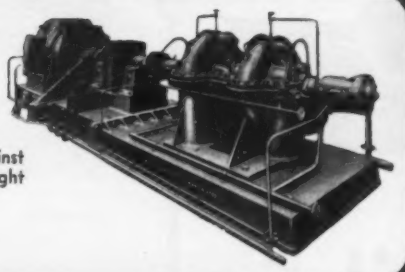
Main Pipeline Pumps....



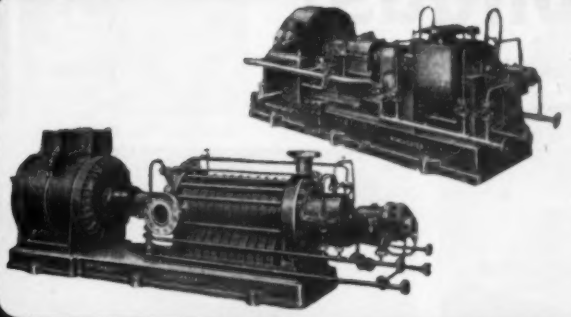
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps

Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.



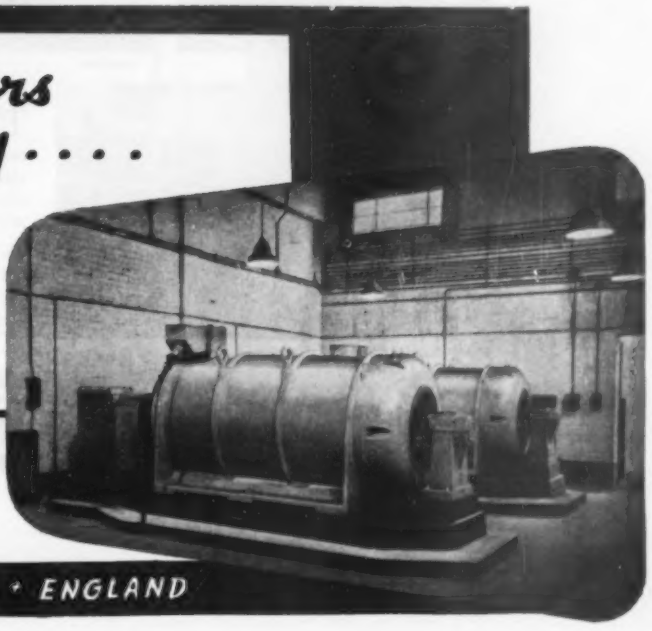
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.



MATHER & PLATT

LIMITED

PARK WORKS · MANCHESTER, 10 · ENGLAND

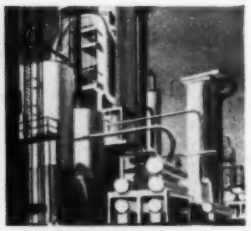
It Takes a TEAM
to Make a Tankful!

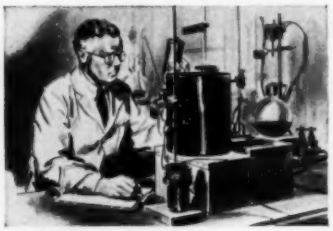
Mobilgas
SOCONY-VACUUM

GEOLOGISTS

DRILLERS

CONSTRUCTION WORKERS


REFINERY TECHNICIANS


SCIENTISTS

SAILORS

TRUCK DRIVERS

STATION ATTENDANTS

THESE PICTURES depict the many operations necessary to produce and deliver the high-quality gasoline modern car engines require. These operations demand specialized skills, the labor of an army of workers. And these skills and labor must be fused into an efficient team if the price of gasoline is to remain low.

The Makers of Mobilgas, along with the entire petroleum industry, are proud that *today's gasoline does 50 per cent more work—yet costs no more (before taxes)—than gasoline of 25 years ago!*

SOCONY-VACUUM OIL COMPANY, INC.
and Affiliates:
MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION

SOCONY-VACUUM

GRAVER

CONSTRUCTION

PUMPING STATION

BLENDING PLANT

REFINERY

Graver Construction Service provides the skill and facilities to cover full responsibility for the engineering, procurement, and erection requirements of refineries, blending plants, pumping stations, and pipe line terminals. This complete service applies to installation of new facilities . . . expansion of existing equipment . . . maintenance and repair.

GRAVER CONSTRUCTION CO.

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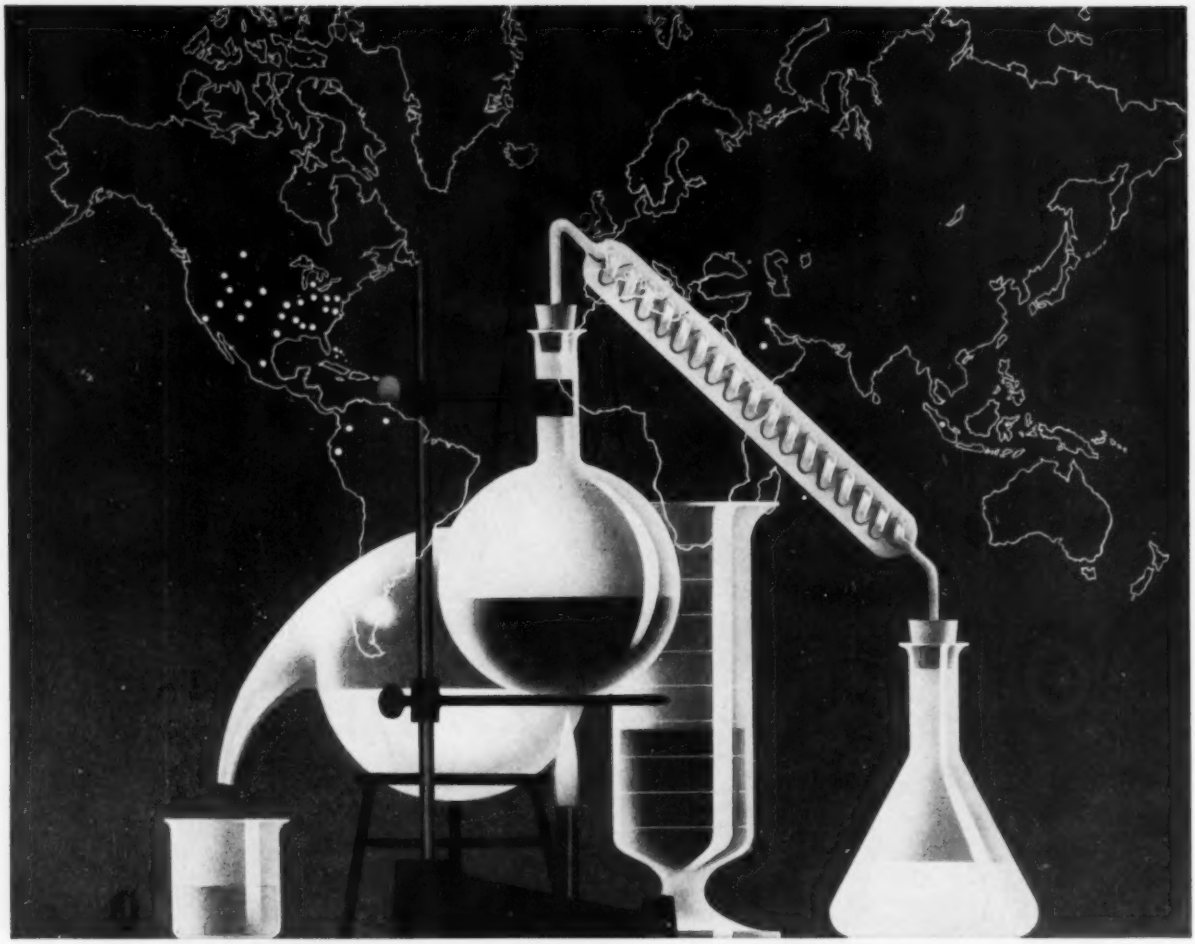
NEW YORK HOUSTON

A DIVISION OF

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, IND.



OUR "LABORATORY" EXTENDS OVER THOUSANDS OF MILES

Every oil field in the free world is in a sense an extension of the big Halliburton laboratory in Duncan.

Each has contributed to the vast store of knowledge that directs the design of Halliburton cementing equipment and every detail of Halliburton procedure.

Each has added to the tremendous total of cementing jobs successfully completed by the Halliburton organization—a total that exceeds the million mark.

Each has helped us to render constantly improved service at an average cost that is actually less today than in 1924.

Earle P. Halliburton

Chairman of the Company

HALLIBURTON OIL WELL CEMENTING CO.

Duncan, Oklahoma

There's an INTERNATIONAL TRUCK to do the job BETTER

International Light-Duty
Model L-120, 115-inch wheelbase, 6½-foot pickup body.

Because International Trucks have worked at *every* job, they can take on *any* job . . . they're ready for any load and any road. Remember:

1. There is an International specialized for *your* work. With 115 basic models, plus many variations, you can choose from this complete line of trucks to do your job better.

2. Over a million Internationals are at work around the world today—more than half of the Internationals built in the past 44 years. That's real proof of long truck life.

We invite you to make a feature-by-feature comparison of an International with any other truck. Your International Truck Distributor can help you discover why it's the best truck investment possible—how you will get lower operating and maintenance costs.

INTERNATIONAL HARVESTER EXPORT COMPANY

World-wide distributor of products manufactured by the International Harvester Company in the U.S.A. and by affiliated subsidiaries in Canada, the United Kingdom, France, Germany, Sweden, Mexico and Australia.

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International Medium-Duty
Model L-161, 154-inch wheelbase.
12-foot stake body.

INTERNATIONAL TRUCKS

Better Living through Better Roads

Carbometals LTD

—manufacturers of

FISH-TAIL & DRAG BITS for exploration and production drilling

*

Designed for drilling in exceptionally hard and abrasive formations.

All 'Carbometal' Bits are hard-faced with a special grade of Titanium Carbide which ensures prolonged service life.

Drillers report that these bits have been used with outstanding success in formations where, formerly, roller-type bits had to be used.

*

Carbometals Ltd. also manufacture:

TITANIUM CARBIDE HARD-FACING ELECTRODES

DRILLING AND CORING CROWNS

INSERTS FOR CROSS-TYPE AND CHISEL-TYPE PERCUSSION DRILLS

DIAMOND-IMPREGNATED CROWNS

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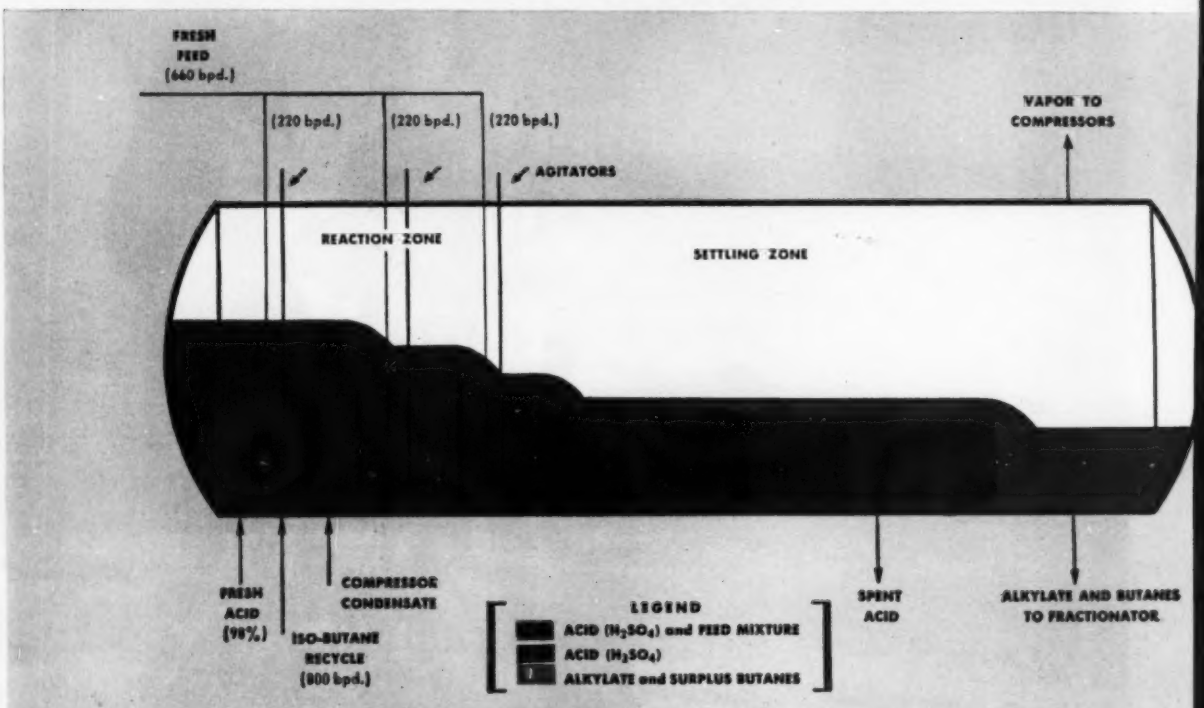
Telephone: Primrose 2265 *Cables: Carbometal, London*

"Through the development of its resources society acquires skilled workers and technicians and a vast storehouse of knowledge with which to make further progress. Man's greatest resource is his own resourcefulness."

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

This NEW Kellogg-cascade reactor initial cost



How New Reactor Maintains 9-to-1 Isobutane-Butylene Ratio

Assume, as a simplified case, that fresh feed is charged to the reactor shown here at 660 barrels per day. This feed, comprising a mixture of approximately 300 barrels of butylene and 360 barrels of isobutane, is divided into three equal 220 BPD portions, each of which is introduced into one of the three reaction sections.

To increase the amount of isobutane at the points of reaction, a recycle stream of isobutane from the unit's main fractionator is fed in at the bottom of the first section. This recycle must be at a rate of 800 BPD to provide the desired isobutane-butylene ratio.

Adding up the total amount of isobutane in the first reaction section, we find there are 920 barrels to 100 barrels of olefin. Since only about 110 barrels of the isobutane reacts with the total olefin present, about 810 barrels of excess isobutane are carried over into the second section where the cycle starts over again.

Thus, while the total amount of olefin charged each day to this reactor is 300 barrels and the total amount of isobutane is 1160 barrels (a ratio of about four-to-one), the actual ratio at all reaction points is better than *nine-to-one*.

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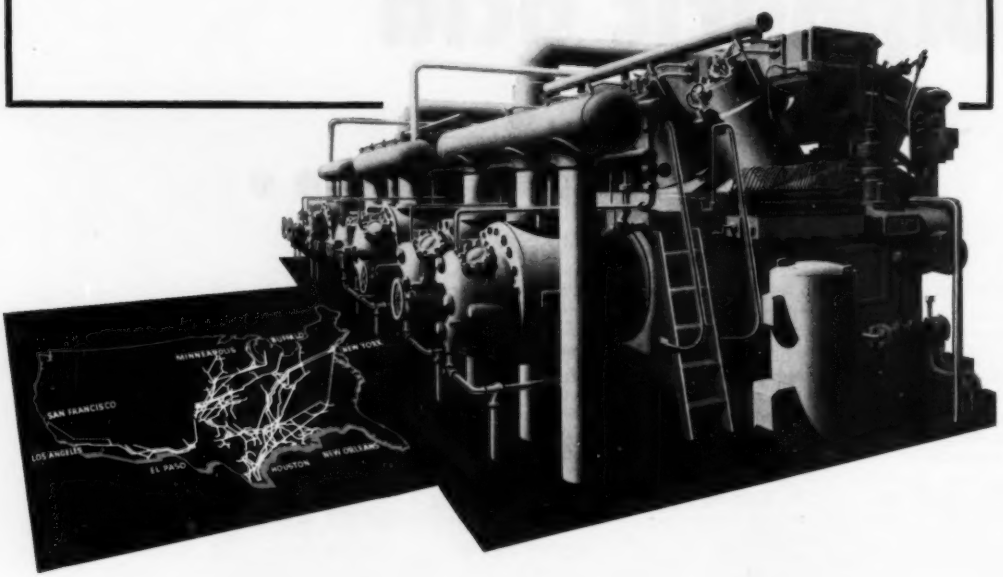

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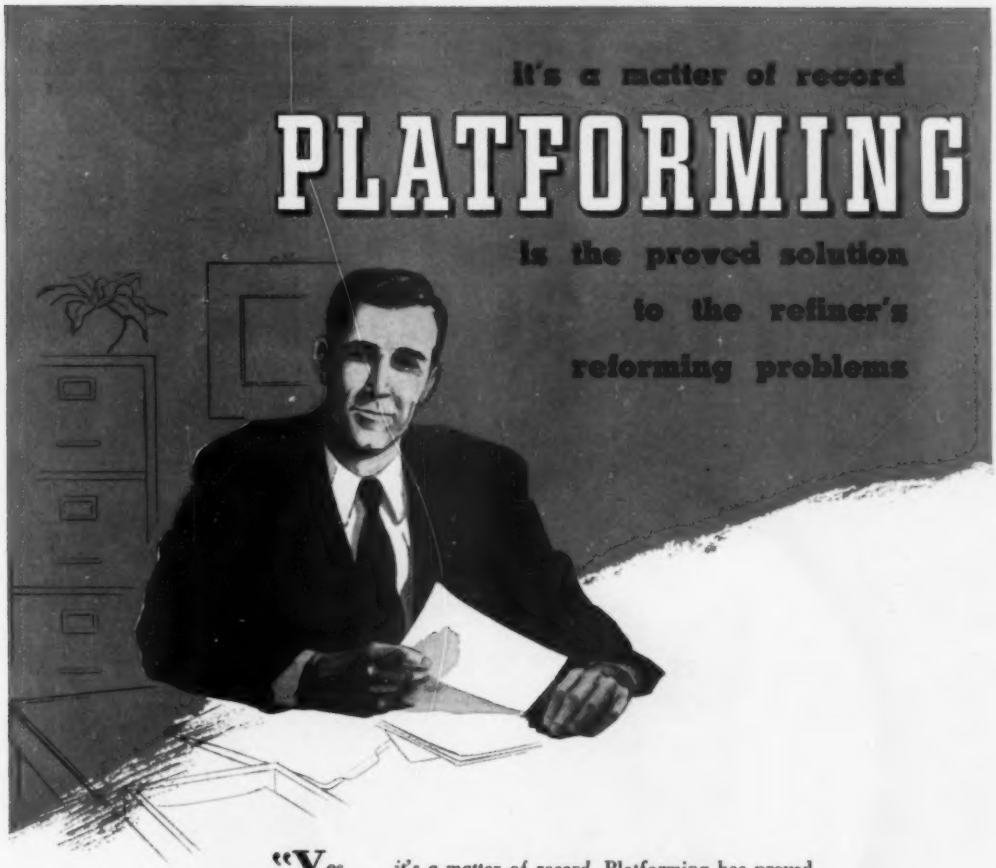

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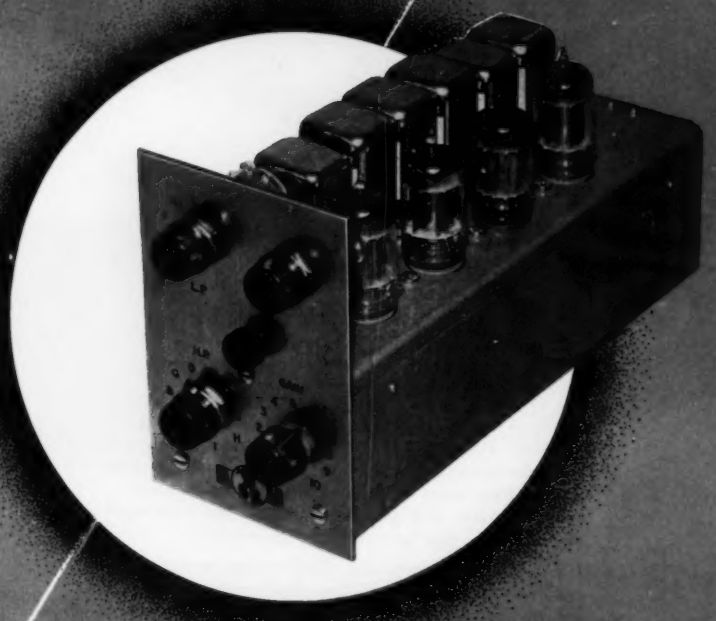

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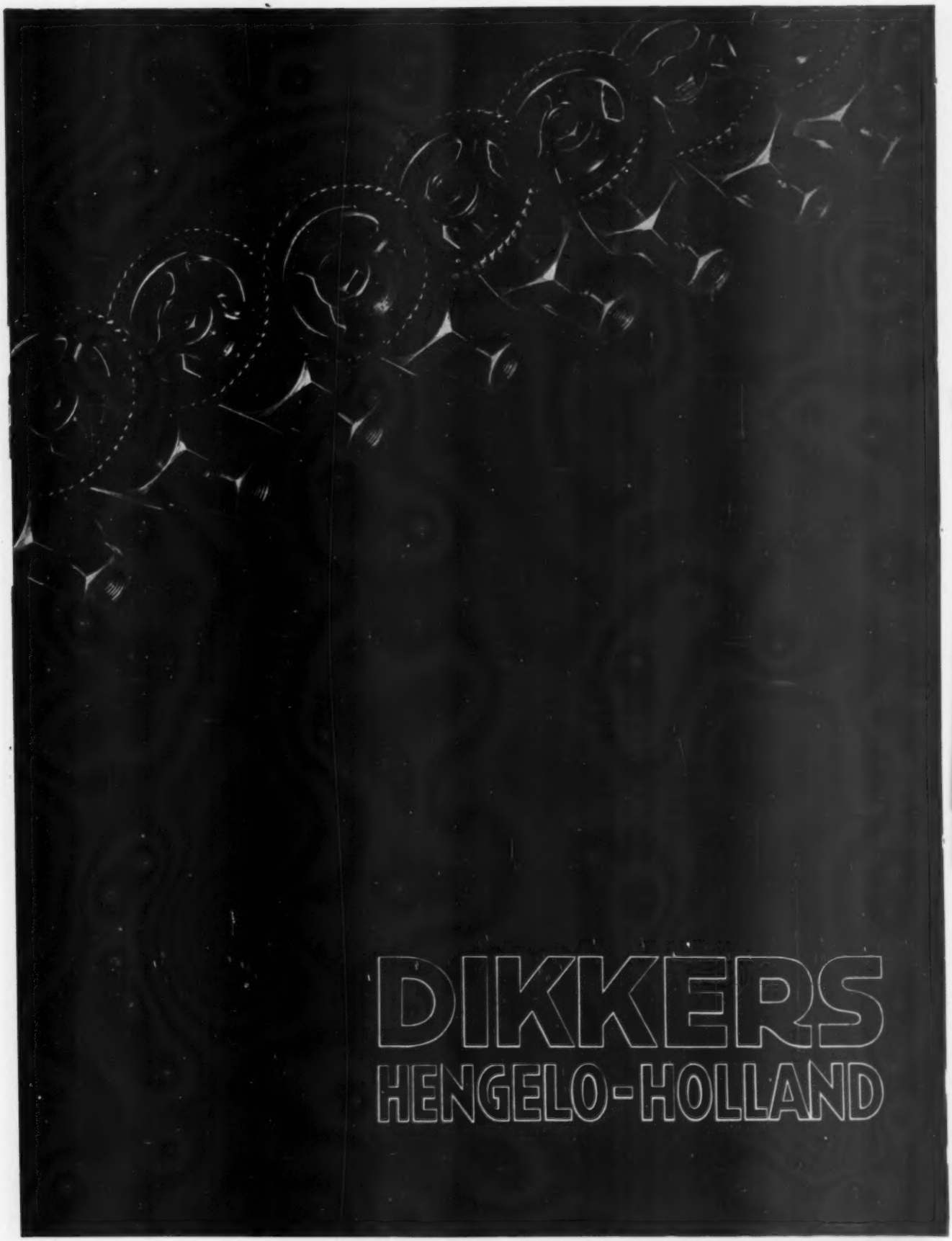
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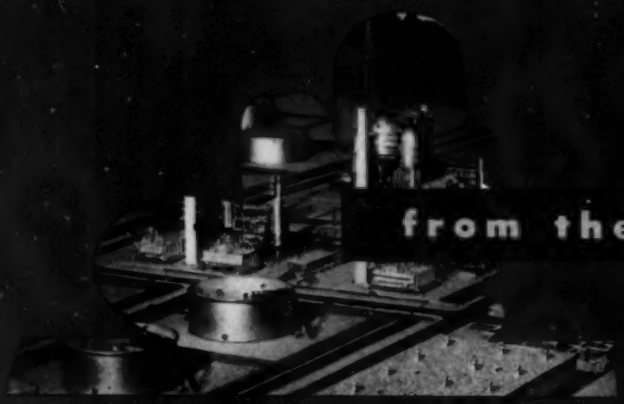

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APRIL 1952

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THIS MONTH'S COVER

The two heaters used on the 4,500 barrel per day UOP Platforming unit at Eastern States Petroleum Corp., Houston, Texas: one heater preheats the charge to the first reactor, and the other reheats the streams between successive reactors. A common stack (center) serves both heaters, which are of the UOP center-wall updraft type.

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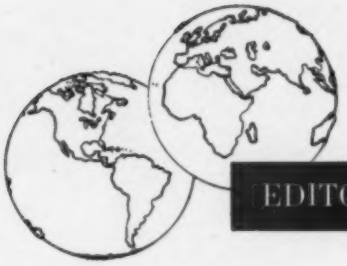


EDITORIAL

TANKER CONSTRUCTION TO MAINTAIN PACE

TESTIMONY to the extraordinary expansion of the oil industry as impressive as that provided by growing statistics of production and consumption is provided by the rapid enlargement of transport facilities so vitally essential to meeting the industry's increasing responsibilities. This applies to land systems, to craft plying coastal and internal waterways, and is particularly in evidence in the development of ocean tankers, which collectively now form the largest group of maritime voyagers. In the case of ocean shipping, the problem of keeping pace with growing requirements has been complicated by the opening of new and highly productive fields in parts of the globe far distant from markets capable of absorbing their output.

During the late war the necessity of moving the vast tonnages of petroleum products demanded for military operations on opposite sides of the planet led to the most intensified construction activity the world had seen up to that time, an undertaking which of necessity was centered mainly in the United States. The need for producing a great number of ships and of turning them out with all possible speed led to the adoption of a uniform size and type of vessel. During the period from 1942 to the close of the war some 770 tankers, built to the specifications adopted—double the number previously built—were launched from U. S. yards.

While the war was responsible for a great array of new tankships built to meet emergency needs, it also was marked by very heavy losses among vessels of this class, due to submarine depredations and other causes. When the new era of oil expansion began, directly after the close of hostilities, many of the tankers built for the United States government were sold to American and other shipping companies. Diversion of these vessels to commercial use helped to meet a critical situation, but did not fill the gap. Since that time there has been a continuing race to supply adequate cargo space.

The combined influence of these factors has been reflected in the building of larger ships in recent years. A step in this direction was the construction of a group of 28,000-ton tankers built in the United States at the instance of the Navy and with the status of reserves for national use in the event of war. As new keels were laid the number of ships of increasing size built on both sides of the Atlantic purely with a view of commercial use further increased, culminating in orders recently placed with British yards for several tankers of 44,000 tons deadweight. These ocean liners with a draft of 35 feet or more obviously will be limited in the range of their operations by the depth of water available for berthing at the ports they visit. Their emergence presumably is inspired in part by the rise in oil production in the Near East and the Caribbean, providing cargoes for movement to refineries with deep water berthings in western Europe and the United States. There are many terminals however which must depend upon ships of lesser draft. The majority of the tankers recently built or building are within the 20,000-ton limit so that the average speed and capacity of the world fleet as a whole has not advanced as much as the few spectacular examples of very large vessels might suggest. A large number of wartime or pre-war construction tankers will be due for replacement within the next few years, and the average may be expected to rise.

A study issued recently by Benedict Saurino of Sun Oil Company contains some interesting comparisons. He assumes that the world's daily production of oil will rise from 11,295,000 barrels daily in 1952 to 14,000,000 in 1957, a conservative forecast since it envisages an increase of less than five percent a year. On this basis, and using the T-2 standard of measurement, he calculates that 2,118 tankers will be needed and that 2,157 will be available by 1957. This forecast contemplates a continued program of active construction, but of somewhat smaller proportions than is under way at the moment and it does not attempt to determine the number of withdrawals. It is intended rather to provide a general picture of probable developments in the tanker industry during the coming five years.

Costs of tanker construction have risen in line with all other costs of labor and materials, and the capital investment in the active tanker fleet runs to the thousands of millions of dollars, even with due allowance for depreciation of the older ships. The assured prospect for this branch of the oil industry is one of continued expansion in numbers and efficiency and a rising scale of capital expenditure.

Two 32,000 dwt tankers in fitting-out basin at Vickers-Armstrong Ltd. yards, Barrow, England.

Rapid Growth of World's Tanker Fleet

By E. Lawson Lomax

IN THE five years from 1946 to 1951, the world's daily production of petroleum has increased from 7,520,900 barrels per day to 11,701,500; that is, taking the year 1946 at 100 percent, the present percentage is 155.5 percent—an average increase of 11.1 percent per annum in spite of the fact that there was a decrease in production in 1949 of 52,600 barrels per day compared with 1948.

Along with this rapid increase in production and consumption during these years, there has been a corresponding growth in the need for expansion of transportation facilities, as production naturally demands transportation, both from the wells to refineries wherever situated, and from refineries to markets. Without these facilities, it would be impossible for the petroleum industry to satisfy the growing world-wide requirements for its products.

During World War II, very heavy losses were sustained by the world's tanker fleet due to submarine attack and other causes. As a result, the industry was faced at the conclusion of that conflict with a serious shortage of tanker tonnage, in spite of the large production in America during the war years of the T-2 type of tanker of about 16,500 dwt capacity.

This capacity for a tanker was higher than the average existing capacity prior to the war, and has had a considerable influence on the average size of tankers built since the cessation of hostilities, apart from that also exerted by the rapid growth of the demand for petroleum products and by the increase in production, particularly in the newer Middle East fields, which has almost trebled during the past five years, and is nearly seven times as great as in the last pre-war years.

It is not surprising, therefore, that tanker construction has been accelerated during the past two or three years with particular emphasis on higher speeds and greater capacity, a movement which is still continuing.

In 1950, this increase was marked by the launching of the S.S. Velutina, with a dwt of 28,000, built for the Anglo-Saxon Petroleum Co. of the Royal Dutch/Shell Group, the first of a batch of six tankers of the same size ordered by this company and with a speed of 16 knots.

This launching was soon followed by the launching of a vessel of a similar capacity, S.S. British Adventure, being one of six ordered by the British Tanker Co. (Anglo-Iranian Oil Co., Ltd.) which also has on order six further vessels of 32,000 dwt.

Other large tankers of 31,000 and 32,000 dwt, to the order of the North American Shipping & Trading Co. (London) Ltd., have also been launched, and this company has also placed orders for two 44,000 dwt tankers of a speed of 17 knots, which are the world's largest tankers yet on order, and on which construction is beginning immediately. Several other large tankers with high speeds are also on order or being built in European and American shipyards.

At the commencement of 1952, the world tanker fleet had attained a total of 2,296 vessels of 29,770,000 dwt—by far the largest figure in its history. During the previous 12 months, 73 tankers of 5,000 dwt or over were launched from British yards, while in addition 72 were launched from continental Europe and America, a total of 145 from all yards. The deadweight tonnage of these vessels was 2,330,190, so apart from any scrapping due to obsolescence and sea losses, the world's tanker fleet was increased by 8.5 percent during 1951, which is less than the world's average increase in petroleum production during the past five years. It would appear therefore, as tanker requirements follow closely upon world production, that the building of new tankers is still lagging behind world oil production, as it must not be forgotten that

The British Adventure is one of a group of 12 supertankers built or on order for British Tanker Co., affiliate of Anglo-Iranian Oil Co.

The Velutina was the first of Shell's 28,000 dwt tankers to go into service. She picked up her first cargo of Persian Gulf crude at Kuwait in December, 1949.

some of the present world fleet is rapidly becoming obsolescent and due for scrapping. Further, many of these vessels are of small tonnage compared with the present standard and even at ruling charter prices it is only necessity which keeps them in service.

Many of these vessels have a maximum speed of 12 knots compared with an average speed of over 14 knots for present construction, and, therefore the equivalent of this tonnage at an average speed of 12 knots is 1,550 T-2's of 14 knots. This would appear to confirm the present shortage of tanker capacity.

According to present figures, it would appear that a T-2 tanker equivalent in production would be about 6,600 bbls per day, and that to handle this increase in world production one standard T-2 tanker would be required. Taking the average rate of increase of production over the last five years, this would mean that the provision in tankers of an equivalent of 172 T-2's each year would be required to keep the world's tonnage balanced, providing there was no scrapping or sea losses. It is a fair estimate that at least 4 percent of the tankers afloat will have to be scrapped each year, and on the basis of 2,296 tankers in commission at the end of 1951, this means scrapping 92 per annum and increasing the ships required for increased production by that amount.

This 92 is the equivalent of 62 T-2's of 14 knots or 56 T-2's of 15 knots. Therefore, in order to keep the world's tanker fleet in equilibrium with requirements, future building programs would require the provision of 2,430,000 dwt, which is about the present capacity of established shipyards.

At the end of 1951, in British shipyards, 152 tankers were being built or on order for British owners and 82 for foreign interests, with a total dwt of 4,530,-260, while in other European yards, 13 were for British interests and 243 for foreign interests, with a total dwt of 4,-947,100, giving a total of 165 tankers for British interests and 325 for other interests.

On the same date of December 31, 1951, the number of ocean-going cargo and passenger vessels on order or building in British shipyards was 281, with a total dwt of 2,765,100, and in continental yards the number was 356 with a total dwt of 3,587,670. That is, in British shipyards, in numbers of ships building or on order, 45 percent were tankers, but in dwt the quantity was 62 percent. In continental yards, tankers were 40 percent in number and 58 percent in dwt. The serious shortage of tankers since the war and their importance in regard to world supplies of petroleum has led to this large proportion of construction in shipping tonnage, but it is doubtful whether the shipyards in future will be able to devote so much of their facilities to tanker construction alone, and they will have to center to a greater extent on general cargo and passenger ships.

This large proportion of tankers does however emphasize the important part which the petroleum industry is playing in supplying so much work for the shipyards.

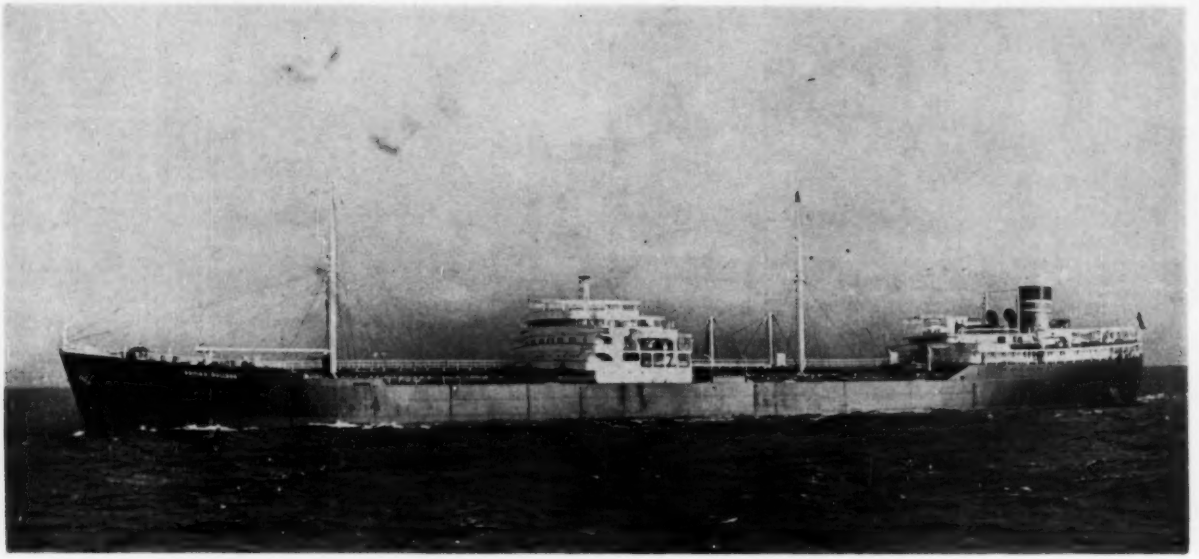
When one considers the specifications for a modern oil tanker, it is readily realized that the general standard of equipment is high even compared with the modern luxury liner; indeed it is questionable whether the accommodation provided for members of the crew, the engineers and officers is surpassed in any form of ocean transport. As the tanker spends less time in port than any other type of vessel, it really becomes the home of its personnel, and as such, the owners have realized that in his home the sailor should have at least a modicum of comfort to balance his long periods of absence from shore life.

Separate rooms for members of the crew, with first class bathroom and lavatory accommodation together with recreation rooms, smoking rooms and mess rooms have now been accepted as standard practice. The petty officers have a separate mess, smoking room and galley. The engineers' and officers' dining rooms are situated in close proximity to the galley, so that they are assured of quick service and hot food when off duty for meals, while lounges are provided for their comfort during general off-duty hours.

Navigational aids consist of wireless communication, direction finders, radar and echo sounding apparatus, while the most elaborate fire precaution and fire fighting services are standard equipment.

It will therefore be seen that apart from general increasing costs of construction, further considerable costs are involved in the provision of these extra amenities and improvements.

At the end of December, 1951 there were 515 tankships amounting to 10,577,-



Anglo-Iranian Oil Company's 28,000 dwt British Bulldog.

000 dwt on order or under construction in the world's shipyards, apart from U.S.S.R. It is a notable fact that of the above total of 515 vessels, the larger number is to the order of independent shipowners, i.e. 381 against 134 for the direct account of oil companies. Pre-war, the oil companies owned a much larger proportion of tanker tonnage than independent shipowners, but at the completion of the present building program the situation will be reversed, although it must also be understood that a large number of the tankers projected by the shipping companies are booked for long time charter by the oil companies, in some cases even before the keels are laid down.

The present cost of the modern British tanker averages about £50 ($140) per dwt, so the capital involved in the present construction program amounts to over £500 million ($1,400 million) which sum would put a heavy strain on oil companies' finances had they to provide this necessary tonnage in addition to the outgoings for field operations, erection of refineries, and all the accessories thereto for their own account. It is a very healthy sign and shows the great confidence placed in the future of the oil industry when outside capital is available and willing to participate in it in this manner. Of the present total of 29,770,000 dwt of tankers afloat, about 13 million dwt is controlled by these outside interests which have been encouraged in this and welcomed by the oil industry, and more will be required in the future.

The question arises as to the most suitable and useful size of tanker which should be put into commission by these independent shipowners. There is and has been a certain demand for the larger sized tankers, but the usefulness of these is to an extent limited, acting as they will mainly as floating pipe lines for the carriage of crude oil from the source or port of production to the refinery centers. At most of these places, port facilities for the loading and discharge of these vessels of about 35 feet draft can be made available, but there are many places where port facilities are such that vessels of this size are unable to berth, and where charterers will require vessels of less draft, i.e. about 28-31 feet, as general purpose vessels for a large amount of their work. That being so, the future building program should be based on an equable supply of the various classes of tankers so that the owners will not be saddled with such an excess of these large tankers as to render them not fully employable, especially in times of slack trade which may arise in future and must be budgeted for.

The question of dry-dock facilities for the super tankers is one which must not be lost sight of, as dry-docks of sufficient size to accommodate these vessels are not to be found in all parts of the globe, and breakdowns can and do occur in most unexpected places.

Another point which naturally arises in the question of large production of tankers at high costs is that of depreciation, since at present the allowable is not high enough to cope with the rising prices of new production, nor is the situation very clear as to steel supplies for the purpose, in view of the large rearmament program in most of the shipbuilding countries. The question of priority allocation of this material is one which is causing many headaches in the industry from all sides.

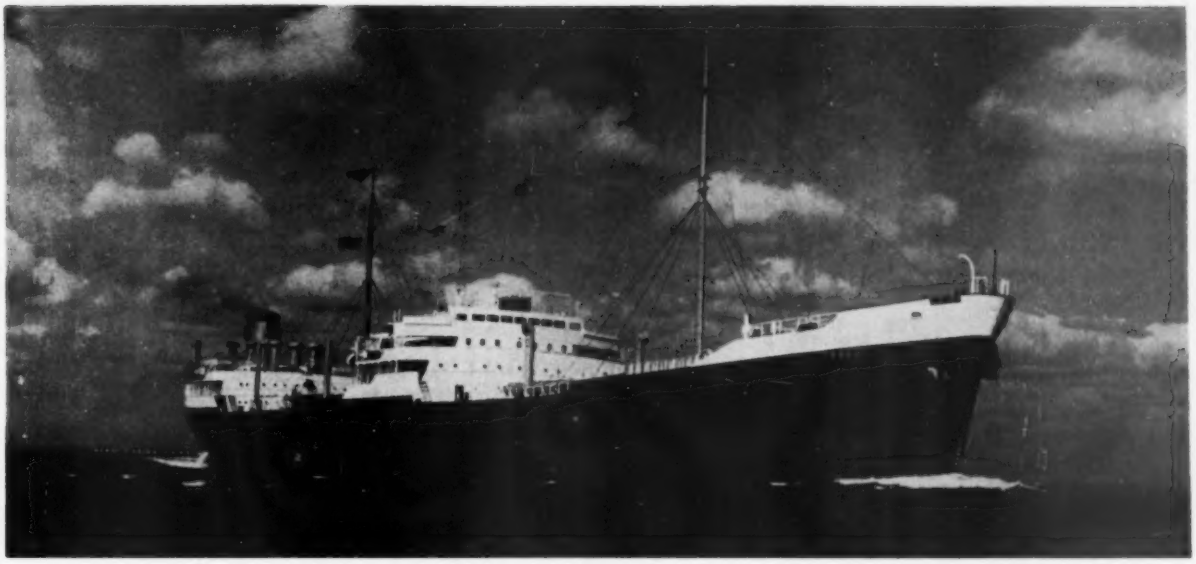
If one examines the list of tankers under construction or on order in the United Kingdom and on the continent, one cannot fail to be struck with the large proportion of vessels envisaged by independent shipowners as against the proportion envisaged by the oil companies. In United Kingdom shipyards there are 87 vessels with a total of about 1,742,000 dwt to the order of the various oil companies, together with 167 vessels with a total of about 2,788,000 dwt to the order of shipping companies; but on the continent the difference is much more marked, with 25 vessels of 488,000 dwt to be built for the oil companies against 231 vessels of about 4,073,500 dwt for the shipping companies.

An interesting point arising out of analysis made of the pre-war tanker fleets and the present expansion program is that of the change in the prime movers. Before the war, the building of diesel engined tankers was outstripping those powered by steam prime movers, and in the latter case, the reciprocating engine was being displaced by turbine and turbo-electric drives.

While the turbine drive is being largely used for the super-tankers, yet the percentage of diesel engines on order or being constructed easily comes first in numbers. At the present time in British shipyards there are 151 diesel propelled vessels on order or under construction totalling just over 2,640,000 dwt, against 83 turbine or turbo-electric vessels of just over 1,873,500 dwt: i.e., of the total tonnage, 58 percent will be diesel driven.

In continental yards there are 192 diesel propelled vessels under construction or on order with a total of 3,406,000 dwt, as against 62 turbine and turbo-electric driven vessels with a total of about 1,526,600 dwt, and only two steam reciprocating engine driven vessels of 20,600 dwt: i.e., of the total dwt, 70 percent will be diesel driven.

In the United States, according to re-



The Verena is the second of four 28,000 ton tankers ordered for the Shell fleet.

ports available, there is no diesel engined tanker construction in hand, all being confined to turbine driven vessels.

In Denmark and Norway one turbine driven vessel is being built as against 40 diesel driven, and in Sweden the proportion is 89 diesel driven as against only six turbine driven.

Generally speaking, turbine drive seems to be favored for the larger sized tankers, although one of 29,500 dwt building in Sweden will be diesel driven.

It is acknowledged that the fuel consumption of a turbine driven vessel is about double that of a diesel driven vessel of the same capacity, and one would therefore expect the preponderance of this drive over turbine drive, but fuel consumption is not the only factor determining the method of propulsion. A single-screw diesel engine cannot develop more than about 7,000 hp, which is the power required for the modern tanker of about 18,000 dwt. For a larger vessel, twin screws with all their disadvantages and duplications are necessary; therefore, the diesel drive has a distinct advantage for the standard tanker of 16-18,000 dwt. On the other hand, when steam is required for the operation of pumps, tank cleaning and other purposes, auxiliary equipment for that purpose has to be provided.

With a turbine driven vessel much greater horsepower can be developed on a single screw, which is an obvious advantage, while in addition no auxiliary equipment is required to supply steam for the usual services.

From the foregoing, it can readily be conceived that British and European shipyards are assured of full occupation on new tankers for the ensuing five years at a minimum, and with the growing demands of the petroleum industry, the prospects are that this period will be considerably extended, particularly if the demand for tanker voyages is maintained at comparable rates with increase in production and consumption of petroleum products.

ANALYSIS OF TANKERS UNDER CONSTRUCTION IN SHIPYARDS OF THE WORLD DEC. 31, 1951.

WESTERN HEMISPHERE SHIPYARDS	NO. OF TANKERS BUILDING	GROSS TONS	DIESEL	GROSS TONS	TURBINE	GROSS TONS	RECIPROCATING STEAM	GROSS TONS	NOS.	OIL COS.	NOS.	INDEPENDENTS
CANADA												
Canadian Shipbuilding & Engineering Co. Ltd., Collingwood	1	12,000	—	—	—	—	1	12,000	1	12,000	—	—
Collingwood Shipyards, Collingwood	2	23,595	—	—	2	23,595	—	—	1	11,000	1	12,595
Total Canada	3	35,595	—	—	2	23,595	1	12,000	2	23,000	1	12,595
UNITED STATES												
Bethlehem Steel Co., Quincy	17	299,170	—	—	17	299,170	—	—	4	56,000	13	243,170
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.	10	153,000	—	—	10	153,000	—	—	10	153,000	—	—
Sun Shipbuilding & Dry Dock Co., Chester, Pa.	4	68,000	—	—	4	68,000	—	—	4	68,000	—	—
Total United States	31	520,170	—	—	31	520,170	—	—	18	277,000	13	243,170
JAPAN												
East Japan Heavy Inds, Ltd., Yokohama	1	15,500	1	15,500	—	—	—	—	—	—	1	15,500
Harima Shipbuilding Works, Ltd., Aioi	3	36,000	3	36,000	—	—	—	—	—	—	3	36,000
Hitachi Shipbuilding & Engineering Co. Ltd., Sakurajima	4	50,600	—	—	4	50,600	—	—	—	—	4	50,600
Kawasaki Dockyard Co. Ltd., Kobe	1	13,000	1	13,000	—	—	—	—	—	—	1	13,000
West Japan Heavy Industries, Ltd., Tokyo	2	35,300	—	—	2	35,300	—	—	2	35,300	—	—
Total Japan	11	150,400	5	64,500	6	85,900	—	—	2	35,300	9	115,100

ANALYSIS OF TANKERS UNDER CONSTRUCTION IN SHIPYARDS OF THE WORLD DEC. 31, 1951.

BRITISH SHIPYARDS	NUMBER OF TANKERS BUILDING	GROSS TONS	TURBINE AND TURBO ELECTRIC DIESEL	TURBINE AND TURBO ELECTRIC NO.	BRITISH OWNERS GROSS TONS	BRITISH OWNERS NO.	FOREIGN OWNERS GROSS TONS	FOREIGN OWNERS NUMBER	OIL COS.	OIL COS. NO.	INDEPENDENTS
Barclay Curle & Co. Ltd.	3	36,500	3	—	—	3	36,500	—	—	3	36,500
Bartram & Sons Ltd.	1	12,000	1	—	—	1	12,000	—	—	1	12,000
Blythe Dry Docks & Shipbuilding Co.	2	23,600	2	—	2	23,600	—	—	—	2	23,600
Blythwood Shipbuilding Co. Ltd.	10	116,000	9	1	5	60,000	5	56,000	2	22,500	8	93,500
John Brown & Co., Ltd.	7	119,900	2	5	3	61,500	4	58,400	4	72,900	3	47,000
Caledon Shipbuilding & Engineering Co.	2	25,500	2	—	1	12,000	1	13,500	—	—	2	25,500
Cammell, Laird & Co. Ltd.	17	221,900	3	14	15	197,900	2	24,000	15	197,900	2	24,000
Chas. Connel & Co. Ltd.	6	71,700	6	—	—	—	6	71,700	—	—	6	71,700
Wm. Doxford & Sons Ltd.	10	102,600	10	—	9	91,200	1	11,400	5	45,700	5	56,900
Fairfield Shipbuilding & Engr. Co. Ltd.	6	79,000	3	3	2	30,000	4	49,000	1	19,000	5	60,000
Furness Shipbuilding Co. Ltd.	30	411,750	26	4	20	265,200	10	146,550	4	51,850	26	359,900
Greenock Dockyard Co. Ltd.	3	33,950	3	—	3	33,950	—	—	—	—	3	33,950
Wm. Hamilton & Co. Ltd.	6	62,000	6	—	2	22,000	4	40,000	1	11,000	5	51,000
Harland & Wolff Ltd., Belfast	13	174,340	5	8	8	115,400	5	58,940	8	115,400	5	58,940
Harland & Wolff Ltd., Govan	7	80,100	7	—	3	29,200	4	50,900	2	18,000	5	62,100
R. & W. Hawthorn Leslie Ltd.	15	189,150	6	9	15	189,150	—	—	10	133,950	5	55,200
Sir James Laing & Sons Ltd.	10	107,000	10	—	8	85,500	2	21,500	1	10,500	9	96,500
Lithgows, Ltd.	15	167,750	13	2	10	110,250	5	57,500	4	46,000	11	121,750
Scotts Shipbuilding & Engr. Co. Ltd.	7	80,450	6	1	4	45,950	3	34,500	1	12,000	6	68,450
Smiths Dock Co. Ltd.	13	147,450	8	5	10	113,450	3	34,000	6	71,000	7	76,450
Swan Hunter & Wigham Richardson, Walker	4	46,200	4	—	3	33,800	1	12,400	1	11,300	3	34,900
Swan Hunter & Wigham Richardson, Wallsend	14	182,570	6	8*	11	139,070	3	43,500	9	115,320	5	67,250
I. L. Thompson & Sons Ltd.	11	124,600	10	1	7	82,300	4	42,300	3	33,500	8	91,100
Vickers Armstrong, Walker	10	165,040	—	10	3	48,300	7	116,740	2	35,300	8	129,740
Vickers Armstrong, Barrow	12	208,900	—	12	8	133,600	4	75,300	8	126,900	4	82,000
Total British	234	2,989,950	151	83	152	1,923,320	82	1,066,630	87	1,150,020	147	1,839,930

* Four turbo electric and four turbine.

EUROPEAN SHIPYARDS	NO. OF TANKERS BUILDING	GROSS TONS	DIESEL	GROSS TONS	TURBINE	GROSS TONS	BRITISH OWNERS NO.	BRITISH OWNERS	FOREIGN OWNERS NO.	FOREIGN OWNERS	OIL COS. GROSS TONS NO.	OIL COS. GROSS TONS	INDEPENDENTS	STEAM R.
BELGIUM														
S.A. John Cockerill, Hoboken	5	70,720	1	3,220	4	67,500	—	—	5	70,720	—	—	5	70,720	—
DENMARK														
A/S Burmeister & Wain, Copenhagen	7	69,800	7	69,800	—	—	—	—	7	69,800	—	—	7	69,800	—
A/S Nakskov Skibsvaerft	2	19,992	2	19,992	—	—	—	—	2	19,992	—	—	2	19,992	—
Odense Staalskibsvaerft	8	91,000	8	91,000	—	—	—	—	8	91,000	—	—	8	91,000	—
Total Denmark	17	180,792	17	180,792	—	—	—	—	17	180,792	—	—	17	180,792	—
FRANCE														
Chantiers Navals de Caen	1	21,000	—	—	1	21,000	—	—	1	21,000	—	—	1	21,000	—
Soc. des Ateliers et Chantiers de France	3	63,000	—	—	3	63,000	—	—	3	63,000	—	—	3	63,000	—
Chantiers Navals de la Ciotat	3	47,000	1	8,000	2	39,000	—	—	3	47,000	—	—	3	47,000	—
Ateliers et Chantiers de la Seine	4	48,700	4	48,700	—	—	—	—	4	48,700	1	12,500	3	36,200	—
S.A. des Chantiers et Ateliers de St. Nazaire	6	116,000	2	40,000	4	76,000	—	—	6	116,000	2	38,000	4	78,000	—
Total France	17	295,700	7	96,700	10	199,000	—	—	17	295,700	3	50,500	14	245,200	—
GERMANY														
Bremer Vulkan Schiffbau & M Vegesack	5	54,400	5	54,400	—	—	—	—	5	54,400	—	—	5	54,400	—
Deutsche Werft, Hamburg	23	286,800	17	204,900	6	81,900	—	—	23	286,800	—	—	23	286,800	—
Howaldtswerke Hamburg	11	180,800	5	60,300	6	120,500	—	—	11	180,800	—	—	11	180,800	—
Nordseewerke Emden	2	22,000	2	22,000	—	—	—	—	2	22,000	—	—	2	22,000	—
Aktien-Gesellschaft 'Weser' Bremerhaven	3	45,000	—	—	3	45,000	—	—	3	45,000	—	—	3	45,000	—
Total Germany	44	589,000	29	341,600	15	247,400	—	—	44	589,000	—	—	44	589,000	—
ITALY														
Soc. Anon. Ansaldo, Genoa	1	12,100	1	12,100	—	—	—	—	1	12,100	—	—	1	12,100	—
Cantieri Navali Reuniti, Genoa	1	18,000	1	18,000	—	—	—	—	1	18,000	1	18,000	—	—	—
Cantieri Reuniti dell Adriatico	3	45,000	3	45,000	—	—	—	—	3	45,000	1	12,000	2	33,000	—
Total Italy	5	75,100	5	75,100	—	—	—	—	5	75,100	2	30,000	3	45,100	—
NETHERLANDS														
C. Van der Giessen and Zonen, Ijssel	3	27,000	2	20,000	—	—	—	—	3	27,000	1	7,000	2	20,000	Oil Co. 1. 7,000 tons
Nederlandsche Dok, Amsterdam	25	381,820	9	128,700	16	253,120	5	66,620	20	315,200	5	66,620	20	315,200	—
De Rotterdamshe Droogdok, Rotterdam	5	54,600	—	—	4	48,000	4	48,000	1	6,600	5	54,600	—	—	Oil Co. 1. 6,600
Van P. Smit Jr. N.V. Rotterdam	3	50,500	1	14,500	2	36,000	—	—	3	50,500	3	50,500	—	—	—
Dok en Werf Wilton—Fijenoord Schiedam	8	96,600	4	50,600	2	23,000	4	46,000	4	50,600	4	46,000	4	50,600	T.E. Oil Co. 2. 23,000 2 Steam 2 T.E.
Total Netherlands	44	610,520	16	213,800	24	360,120	13	160,620	31	449,900	18	224,720	26	385,600	
NORWAY														
Akers. Mek Verksted, Oslo	1	10,500	1	10,500	—	—	—	—	1	10,500	—	—	1	10,500	—
Bergens Mekaniske, Bergen	3	12,000	3	12,000	—	—	—	—	3	12,000	—	—	3	12,000	—
Framnaes Mek. Sandefjord	3	29,700	3	29,700	—	—	—	—	3	29,700	—	—	3	29,700	—
Fredrikstad Mek V., Fredriksstad	11	114,600	10	101,100	1	13,500	—	—	11	114,600	—	—	11	114,600	—
Kaldnes Mek V. Tonsberg	5	34,700	5	34,700	—	—	—	—	5	34,700	—	—	5	34,700	—
Kristiansands Mek V., Kristiansand	1	7,000	1	7,000	—	—	—	—	1	7,000	—	—	1	7,000	—
Marinens Hovedverft, Horten	4	44,600	4	44,600	—	—	—	—	4	44,600	—	—	4	44,600	—
Rosenberg Mek V, Stavanger	5	69,500	5	69,500	—	—	—	—	5	69,500	—	—	5	69,500	—
Total Norway	33	322,600	32	309,100	1	13,500	—	—	33	322,600	—	—	33	322,600	—
SPAIN														
Euskalduna Cia, Bilbao	1	8,450	1	8,450	—	—	—	—	1	8,450	1	8,450	—	—	—
Union Naval de Levante, Grao-Valencia	1	8,450	1	8,450	—	—	—	—	1	8,450	1	8,450	—	—	—
Total Spain	2	16,900	2	16,900	—	—	—	—	2	16,900	2	16,900	—	—	—
SWEDEN														
Gotaverken A/B, Gothenburg	20	261,000	20	261,000	—	—	—	—	20	261,000	—	—	20	261,000	—
Kockums Mek. Verk. Malmo	27	340,000	22	266,600	5	73,400	—	—	27	340,000	—	—	27	340,000	—
Lindholmens Varv A/B, Gothenburg	4	42,800	4	42,800	—	—	—	—	4	42,800	—	—	4	42,600	—
Oresundsvarvet A/B, Landskrona	6	64,500	6	64,500	—	—	—	—	6	64,500	—	—	6	64,500	—
Uddevallavarvet A/B, Uddevalla	12	141,000	11	121,300	1	19,700	—	—	12	141,000	—	—	12	141,000	—
Total Sweden	69	849,300(Gr)	63	756,200(Gr)	6	93,100	—	—	69	849,300(Gr)	—	—	69	849,300(Gr)	—
Plus: Eriksberg Mek. Verk, Gothenburg	20	385,500(dwt)	20	385,500(dwt)	—	—	—	—	20	385,500(dwt)	—	—	20	385,500(dwt)	—

Processing Of Natural Gas With Package Type Units

By Thoren Priest Cook

Packaged glycol gas dehydration unit.

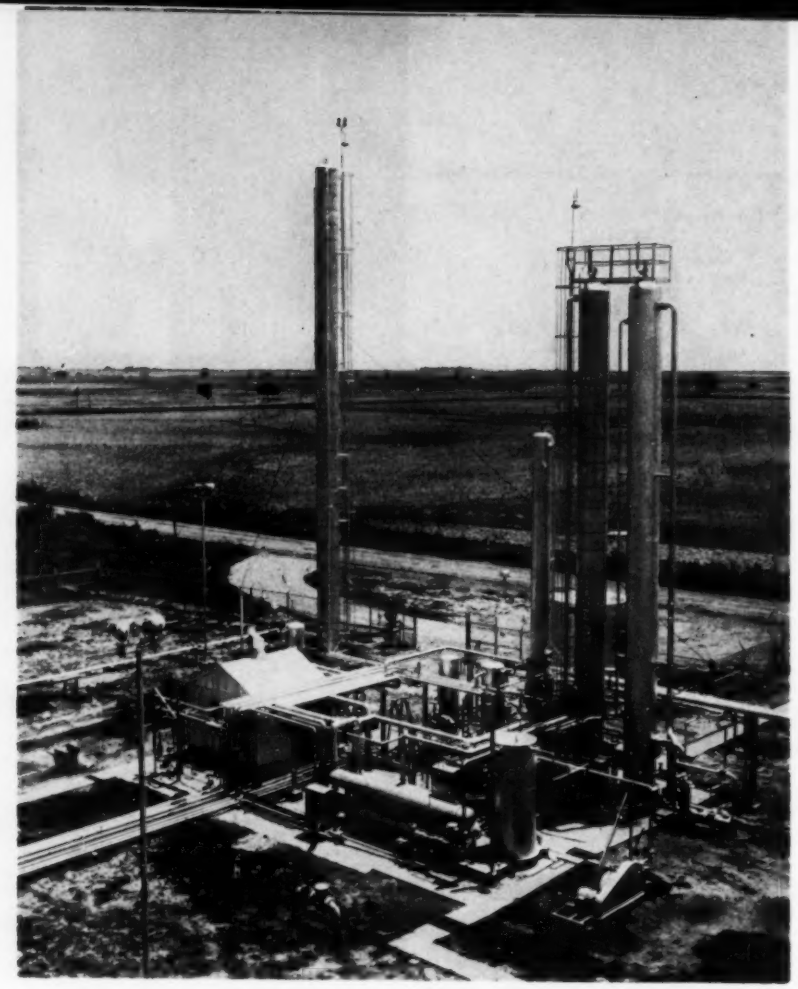
MOST PROCESSING of natural gas is done in large centrally-located units of large size costing up to fifteen or twenty million dollars. In general, this is the most economical way to process natural gas. Certain conditions have recently renewed interest in standard packaged type processing units which are relatively small plants. Small quantities of gas produced with oil, far from gasoline plant gathering lines, has generally been flared. The increased value of natural gas and natural gasoline as well as more stringent regulations on the part of state conservation bodies have reduced this practice greatly. In some cases, gas from high gas-oil ratio wells is compressed back into the formation to maintain pressure. In such instances, extraction of the natural gasoline components will generally pay out the recovery equipment. Often, the gasoline produced can be pumped into a common carrier crude line.

For natural gas processing units in general, it happens quite frequently that the life for a given location will be short. Processing units can be installed in such instances only if the investment is small, salvage value high, and operating and maintenance costs low. The standard packaged units are designed to meet these requirements. In developing a new field, small portable packaged type units will permit rapid installation on a few wells in order to produce revenue while drilling continues. After the installation of a large central processing unit, the small portable units can be moved along as the field develops, always in advance of the gathering system for the permanent plant.

There are also situations which are unattractive to large companies, but attractive to small investors who can form companies whose net income is below $25,000 per year and consequently in the 30 percent corporate income tax bracket. A small utility company can sell the residue gas locally to small towns and another small gasoline company can operate the gasoline plant. Such companies find the standard packaged type units quite suitable to their needs.

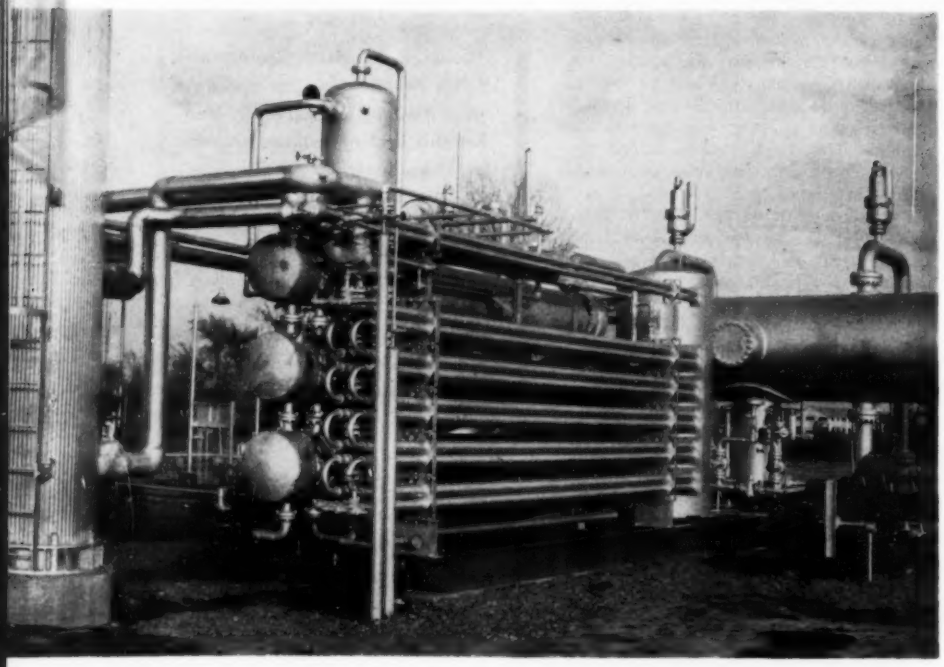
The packaged units are designed from an engineering viewpoint so that all items of equipment will be the economic optimum for the conditions encountered. All equipment within the limits of the skid is shop fabricated to hold field erection costs to a minimum. The equipment is set upon skids to permit rapid installation and high salvage value when moving from one location to another. The use of the same design on many installations with a minimum number of changes reduces engineering costs and eliminates difficulties with automatic control systems, safety shut down devices, and other mechanical equipment. The units are designed so as to require a minimum outlay for operation and maintenance. Undoubtedly, these factors have all contributed to the continued interest in standard packaged processing units, their wide acceptance and

Mr. Cook joined Phillips Petroleum Co. in 1942 following his graduation from Washington University. He handled both operational and design problems in natural gasoline with Phillips and had been supervisory engineer of the process design and development section of the gasoline department for three years when he resigned in 1951 to join Blaw-Knox Construction Company as chief process engineer in the chemical plants division at Tulsa.



View of standard gasoline plant with LPG recovery.

View of dewpoint control station.



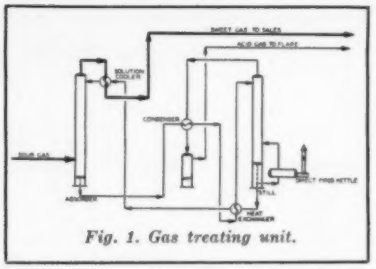


Fig. 1. Gas treating unit.

general success in the natural gas processing field.

For some time, packaged compressors and solid desiccant type dehydration units have been available. Packaged gasoline plants, hydrocarbon dewpoint control units, desulfurization units, and liquid desiccant dehydration units are more recent developments. Figure 3 is a schematic diagram for a standard packaged gasoline plant designed for gasoline, but no appreciable LPGas recovery. The "wet gas" containing condensable hydrocarbons is contacted by counter current flow of 190-200 molecular weight absorption oil in a bubble tray or packed absorber. This absorber is sized large enough to take the desired inlet gas volume and any still reflux tank and storage tank vapors recycled to the absorber. The extraction which can be obtained for given standard oil circulation rates is easily determined. In some cases it is not desirable to recycle any vapors. The rich oil from the base of the absorber is flashed by a pressure reduction in order to furnish stripping vapors for the still. Liquid from the flash tank is heated by heat exchange and a direct fired

TABLE I

DESIGN DATA FOR TWO GASOLINE EXTRACTION UNITS

Inlet Gas	Mol %	Mol %
N_2	...	0.68
N_2S	...	...
CO_2	7.20	...
O_2	...	...
Air	...	...
C_1	78.03	61.72
C_2	7.58	15.00
C_3	4.89	11.66
$1C_4$	9.33	1.72
NC_4	1.22	5.15
$1C_5$	0.09	0.91
NC_5	0.14	1.37
C6+	0.52	1.79
	100.00	100.00
Volume MMSCFD	5.0	5.0
Absorption Press. PSIG	200	200
Effective Abs. Temp. °F	95	90
Lean Oil Circulation GPM	25	25
26# RVP Production GPD	1,715	11,500
Rich Oil Heater Fuel MSCF/D	38	48
Cooling Tower Make-up Water GPD	3,670	4,530
Electric Power KW	10	20
Investment	$50,100	$71,000

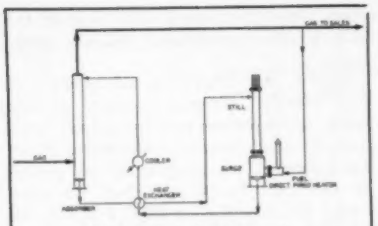


Fig. 2. Dehydration unit.

heater before it enters the still, which is a packed or bubble tray tower. The vapor portion of the feed and the vapors from the lower section of the still are contacted by gasoline and the vapors from the lower section of the still are contacted by gasoline reflux as they travel up the column. This reflux condenses the flashed oil and maintains a proper distillation specification on the gasoline. The liquid portion of the feed and the liquid from the top section of the still travels down the lower section, encountering stripping vapors which remove the gasoline components from the oil. The lean oil from the base of the still is cooled after heat exchange and flows to a surge tank for recycling in the process. The heater is mounted on one skid and all other equipment except the storage tank and cooling tower are mounted on another skid. A fully automatic control and safety shut-down system are provided to protect the equipment. A more complete description was recently given for an actual installation of one of these units.[1] Table 1 lists some design data for two other units.

TABLE II

DESIGN DATA FOR TWO GASOLINE AND LPGAS EXTRACTION UNITS

Inlet Gas	Mol %	Mol %
N_2	1.53	0.68
H_2S	...	...
CO_2	...	...
O_2	...	...
Air	...	...
C_1	78.96	61.72
C_2	11.84	15.00
C_3	4.42	11.66
$1C_4$	0.73	1.72
NC_4	1.23	5.15
$1C_5$	0.32	0.91
C6+	0.63	1.79
NC_5	0.34	1.37
	100.00	100.00
Inlet Volume MMSCF/D	10	10
Absorption Pressure PSIG	525	600
Effective Absorption Temp. °F	100	100
Lean Oil Circulation GPM	60	60
26# Gasoline Production GPD	7,400	25,700
100# LPGas Production GPD	3,400	16,700
Rich Oil Heater Fuel MSCF/D	126	157
Cooling Tower Make-up Water GPD	9,400	11,700
Electric Power KW	65	85
Investment	$210,000	$230,000

A standard unit designed for higher extraction efficiency as well as LPGas recovery is shown in Figure 4. Here again, the wet gas is passed through an absorber where gasoline and some LPGas components are removed from the gas. The rich oil is flashed at reduced pressure in the base of a reabsorber. This vessel is operated at a pressure just low enough for vapors from the still to flow into the reabsorber base. The de-ethanizer overhead product also recycles to the reabsorber. The reabsorber reduces the compressor horsepower required to compress recycle vapors to a pressure high enough to flow into the main absorber.

In certain instances, the reabsorber overhead vapors are not recycled. The liquid from the base of the reabsorber containing lean oil and all unflashed gasoline portions absorbed in the main absorber, in addition to gasoline components absorbed in the reabsorber, passes through heat exchangers and a direct fired heater as it flows to the still. The still operates as described previously, except that in this unit the stripping vapor is steam and the still operates at high pressure. The steam is produced by a steam generator which is heated by hot oil from the base of the still. The steam condensed in the still vapor condenser separates as a water layer in the still reflux tank from which it can be returned to the steam generator. The portion of the hot oil from the still bottoms is circulated through the reboiler of the deethanizer to supply the heat duty for the tower.

This processing arrangement enables the direct fired rich oil heater to carry the entire heating duty of the plant. The liquid product obtained in the still reflux tank is fed to a stabilizer which produces LPGas as a side stream and grade gasoline as kettle product. The equipment in this plant is also skid mounted and provided with automatic controls and a safety shut-down system. Table 2 presents some design data for two such units.

For many reasons gas utility companies sometimes find their line drips are collecting liquids and their line capacity is impaired even though only dry gas has been admitted to the line. Transmission lines take gas from numerous plants operated by many companies. These plants will naturally have different efficiencies. Some plants leave some pentanes and heavier in the residue. In many cases, absorbers and oil bath scrubbers are overloaded or poorly designed, resulting in losses of absorption oil to the residue.

During peak demands, gas from dry gas wells or gas from storage reservoirs may be turned into the transmission line. This practice may allow passage of heavier hydrocarbons to the line. Also, there is always a small amount of lubricating oil lost to the gas during compression operations. At any rate, it may be found that the hydrocarbon dewpoint of the flowing gas is relatively high because of an accumulation of small quantities of heavier hydrocarbons. It has been found that the installation of a hydrocarbon dewpoint control unit can often eliminate this difficulty. If the installation of such a unit is the solution to the problem, the payout is generally very rapid in terms of increased line capacity, even if the volume of recovered liquids is small.

Figure 5 portrays the process flow for a dewpoint control unit. This is an absorption type gasoline plant with a different emphasis on certain design variables. The hydrocarbons to be absorbed are present in small quantities, but they are high in molecular weight. A few trays, low oil-gas ratio, exceptionally good absorber design, and high efficiency mist eliminators are indicated. An absorption oil of 240-250 molecular weight is used.

In order to eliminate the necessity for a dehydrator, dry oil is used. The oil is maintained dry by stripping with vapors in place of steam. The process flow is as described previously in connection with Figure 3 with the exception of the side draw from the still. A kerosine draw is removed from a position in the column a little above the feed tray. All equipment but the absorber, air fin condenser, and storage tanks is mounted on skids. The unit is automatically controlled and protected with a safety shut-down system. Since large volumes of gas are handled, it is sometimes desirable to use for an absorber a horizontal tank provided with one large tray. A high efficiency type mist eliminator is installed in the top side of the tank.

Gas treating plants have also been designed as packaged type units. Figure 1 shows a schematic process flow diagram for a unit employing a water solution of monoethanolamine as treating medium. The hydrogen sulfide is removed by counter current contacting with amine solution. The foul solution is heated to reverse the equilibrium reaction and the released hydrogen sulfide is stripped from the solution by the action of the stripping vapors in the still. The steam from the top of the still is condensed and returned as reflux to prevent amine loss.

A direct fired reboiler furnishes the heat necessary to reverse the reaction between amine and hydrogen sulfide, and provide stripping vapors in the column. This reboiler is especially designed so as to prevent flame impingement and high skin temperatures on the tubes which might cause cracking of the amine. Heat exchange between cold foul amine solution from the base of the absorber and the still overhead vapors provides reflux for the still while heating the amine solution. This heated amine then picks up more heat by exchange with the hot regenerated solution from the reboiler. The re-

[1] *Oil & Gas Journal*, October 25, 1951, Package Gasoline Plant Processing 5,000,000 cu. ft. of Gas Daily.

generated solution is then further cooled by heat exchange with the regenerated gas out of the plant. Cooled regenerated amine solution then flows from the gas cooler to the absorber.

Solution circulation pumps may be driven by gas expansion as the gas pressure is reduced to furnish heater fuel, or they may be driven by gas combustion engines or electric motor drives.

These units can be placed in operation at locations where there is no electric power or water available. The solution strength has to be adjusted to give a heat balance for the average quantity of hydrogen sulfide to be removed. It can be seen that this unit is designed so that the total heat input for regeneration is by direct fired reboiler, and this amount of heat is eventually transferred to the treated gas. The heat of regeneration reaction is balanced by the heat of absorption reaction.

Higher hydrogen sulfide concentrations require the use of an air fin condenser or water cooled condenser on the still. It is necessary to truck the solution make-up water to the plant if water is not available at the plant site.

The unit is completely skid mounted, controlled by a simple positive automatic control system, and provided with an elaborate safety shut-down system. Where electric power is not available at the plant site, the power for the safety shut-down system is generated by a thermopile installed in the heater flame. These units do not require continuous operator attention and may be operated with only a periodic check two or three times each week. Table 3 gives some typical design data for one of these units.

Liquid gas dehydrators have been quite successfully packaged. These units dehydrate the gas by means of countercurrent contacting with diethylene glycol or triethylene glycol. Figure 2 indicates the process flow for such a unit. The glycol containing the water removed from the gas passes through heat exchangers countercurrent to the hot regenerated glycol from the still. After being heated, the glycol flows to the top of a packed tower where the water vapor is distilled off, thereby concentrating the solution. The water vapor passes from the tower to the air through finned pipes which condense sufficient water for reflux, reducing glycol losses from the tower. The base of the still is the regenerated solution surge tank.

TABLE III

TYPICAL DESIGN DATA FOR GAS TREATING UNIT

Inlet Gas	30,000,000 SCF/D
Pressure	300 PSIG
Temperature	70° F Maximum
H_2S Content	5 Grains/100 SCF
CO_2 Content	0.5%
Solution Strength	20 L.V. %
Solution Circulation	35 gpm
Reboiler Fuel	48 MSCF/D
Gas Engine Driver Fuel	7.2 MSCF/D
Outlet H_2S Content	0.25 Grains/100 SCF maximum
Investment	$57,000

TABLE IV

TYPICAL DESIGN DATA FOR GAS DEHYDRATION UNIT

Inlet Gas	20,000,000 SCF/D
Pressure	765 PSIG
Temperature	80° F
Water Content	43 lbs./MMSCF
Dewpoint Depression	50° F
Outlet Water Content	7.8 lbs./MMSCF
Circulation Rate	3 gpm
Reboiler Fuel	7.2 MSCF/D
Electrical Power	5 KW
Investment	$20,500

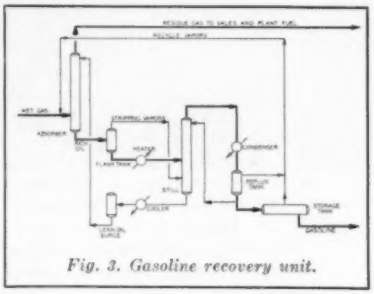


Fig. 3. Gasoline recovery unit.

Heat is supplied to the still by a direct fired reboiler, designed so as to prevent flame impingement and excessively high temperatures. The hot regenerated glycol flows through heat exchangers and a cooler and back to the absorber. In some units, the cooler is omitted and the absorber is sized so that the top portion of the absorber acts as a direct contact solution cooler. The solution circulation pumps may be driven by fuel gas expansion, gas combustion engines, or electric drives, depending upon plant location.

This unit is also skid mounted and provided with automatic controls designed so as not to require continuous operating labor. Some typical design data for one of these units are given in Table 4.

All the standard units can be installed in the conventional way on individual concrete foundations and set up as a permanent installation, or they can be built upon skids as described previously. Concrete footings must be poured for the skids in order to properly support all of the weight on the skids. The heaters are always set upon a separate skid so that they can be installed at a distance from the absorption distillation unit. Because of the size, simple piping and inherent high salvage value, the absorber and storage tanks are set upon individual concrete foundations. A concrete basin must be provided as a foundation for the units requiring a cooling tower.

Units are designed so that they can be trucked over public roads. When moving from one location to another, the interconnecting piping is removed and the large vessels are laid on the truck bed. That is, large vessels mounted upon skids are also removed for individual handling. All the remaining equipment is hauled as it sits upon the skid. Foundations for the skids, absorber, heater, tanks, and cooling tower are not salvable, but 70 to 80 percent of the original investment can be saved by using the package plan.

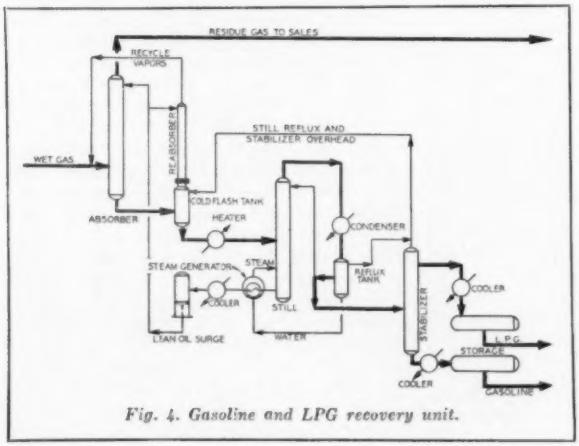


Fig. 4. Gasoline and LPG recovery unit.

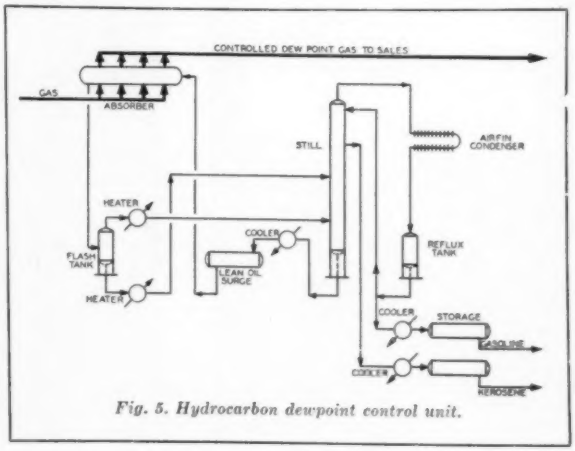


Fig. 5. Hydrocarbon dewpoint control unit.

Interior Department issues permits for 11 wells as quit-claim law again gets Congressional attention.

WASHINGTON DATELINE

OFFSHORE DRILLING RESUMED

By Joseph Huttlinger

THE OWNERSHIP and operation of off-shore tidelands promises to be an issue, perhaps a major one, in the forthcoming national elections. The only thing that could prevent this would be for Congress to complete action and the President to sign a measure giving the states the off-shore oil and gas wealth.

The President has promised he would never sign such a measure. If the states are to have title, then the Congress must override a Presidential veto. Even the most enthusiastic advocates of state title cannot see a two-thirds vote in the Senate to override a veto.

A compromise measure, or a stalemate bringing no legislation whatsoever, could well result, which would throw the tidelands issue squarely into the political campaigns. In either event, the Republican National Committee would be certain to recognize the issue in its platform to be written this midyear, just as it did in 1948. The Democratic National Committee appears more friendly toward federal control. Those Democrats who favor state title will urge the party to ignore the issue altogether, just as it did four years ago.

The drive for legislation to override the U. S. Supreme Court which has three times ruled for the federal government, came to a climax in March in the Senate. A House action, heavily in favor of state title, is still on the books, so that only Senate action and a possible House-Senate compromise are needed before the measure goes to the White House.

At least two significant developments of importance to the petroleum industry during the future are indicated by the recent give and take both inside and outside Congress on the whole tidelands matter.

One is the agreement between several petroleum companies and the Interior Department to go ahead with new drilling in limited areas of the offshore lands as required for conservation reasons. A total of 11 new wells off the coast of Louisiana recently received federal approval, it has been disclosed. The companies which applied for and received Interior Department permits for the drilling —the first permits since Dec. 11, 1950, when Interior assumed control of the offshore lands—include: Magnolia Petroleum Co., Pure Oil Co., Shell Oil Co., Phillips Petroleum Co., and Sun Oil Co.

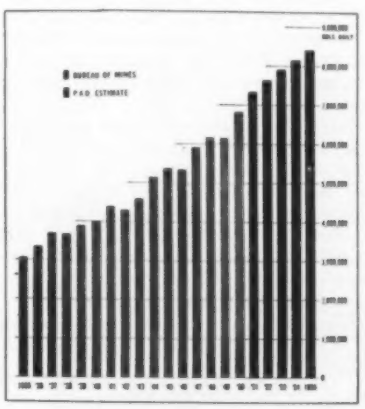
The other development is a growing concern by men in the U. S. Senate that if the federal government can take over the offshore lands and the minerals beneath, it can also take over the mineral wealth beneath land areas of the U. S. Pointing this out, Senator Harry R. Cain, R., Wash., says there is not a single state that does not have some oil, coal or other mineral wealth thus in jeopardy.

The Senator's fear is not a new one. While Governor of Oklahoma, Roy J. Turner repeatedly warned that federal seizure of the offshore lands was a definite step towards government ownership of all underground minerals.

For years, some federal officials have claimed that all underground minerals, oils, gas, coal, gold, iron, or whatnot, should belong to the nation, rather than the individual property owner. They point out that the U. S. is one of the few nations in the world where this is not the case. In deciding the tidelands suits, the U. S. Supreme Court based its decision primarily on the national defense needs for the offshore lands and their minerals. It would require little stretching of the legal theory to make it apply to all oil, gas and other minerals in time of war.

* * *

A committee of Congress gave the Petroleum Administration for Defense a good report card in March on its distribution of oil country tubular goods to American producers. The PAD was "fair and impartial," said the House Small Business Committee in a unanimous report. The committee, which sent its staff to study PAD records and then held a two-day hearing, claimed it had had "complaints," from some oil producers, but it did not identify the complainants.



* * *

A 118-page report on what is ahead for the American petroleum industry has just been made public by the Petroleum Administration for Defense. The report, entitled "Transportation for Oil," was prepared by a staff working six months under the direction of John W. Boatwright, on leave from Standard Oil Co. (Ind.). The document forecasts for each year through 1955 the U. S. crude oil and product demand by areas of the country; crude oil and natural gas liquids availability; refining capacity; and recommends new crude oil and refined product pipe lines and other transportation.

The report, which the PAD calls a definitive study, contains tables of statistics, charts and maps. In quick summary, here is what it says:

1. U. S. demand for crude and products, including military and export demands, is due to climb to 8,383,000 barrels daily by 1955, against 6,803,000 in 1950.

2. U. S. oil fields will be able to produce 7,523,000 barrels of crude daily in 1955, against 6,873,000 b/d in 1950.

3. U. S. refining capacity will climb to 8,550,000 barrels daily by 1955, from 6,963,644 on Jan. 1, 1951.

4. A score or so of major crude oil and products pipe lines, many of them already started, of tankers, barges, and other transportation facilities, are needed by 1955.

The Boatwright report went into Alberta, Canada's crude production, which it estimated at 212,000 barrels daily by 1955, and California's crude oil shortage. It suggested a 20 to 24-inch oil pipe line from Alberta to the Pacific Northwest. This was advanced as the best of six methods of getting crude oil to the U. S. west coast. Three methods involved tankers, vulnerable in time of war. One was for a pipe line from west Texas' Permian Basin, and another for a line from the Rocky Mountain area, but other crude lines either laid or planned, Mr. Boatwright said, will take up all the crude in these two areas.

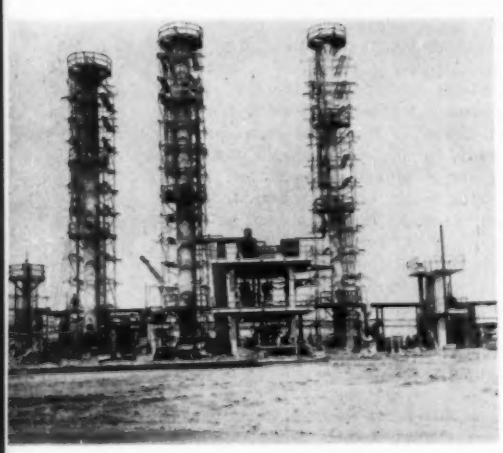
Since the report, Canada has gone ahead with an all-Canadian oil line to end at Vancouver, and the PAD is standing by to approve applications for construction of new oil refineries near its end. The problem of where to build them, in Canada

(Please turn to page 67)

Aerial view of Eastern States Petroleum Company plant at Houston, the new Platforming and Udex unit in the center foreground.

World's First Commercial Undex Unit Installed at Eastern States Plant

Eastern States to recover chemical grade benzene as a by-product of Platforming straight run gasoline to produce aviation blending stock.



Construction view of Udex unit at end of February, 1952.

CELEBRATING its seventeenth year as a refiner and its twentieth year as a marketer of petroleum products, Eastern States Petroleum Company of Houston has entered the petrochemical industry.

First step in the expansion into this new field is the production of benzene from Platformate, utilizing the world's first commercial installation of the Udex process. At a later date the company plans to erect facilities for the production of ethylene and chemical intermediates or derivatives based on tail gases from its thermal and catalytic cracking operations. Eastern States Chemical Corp. has been organized as a subsidiary to carry on the new activity.

Eastern States was organized as a marketer in September, 1932, by R. B. Kahle, president; J. F. McCarthy, vice president; and two associates who have since died. Three years later the group bought the 3,000-barrel Deep Water refinery on the Houston ship channel and began a program of expansion in a difficult period of financial depression. Today the plant processes 50,000 barrels of crude daily, producing aviation base stock and benzene as well as the usual line of motor fuels, middle distillates, and residuals.

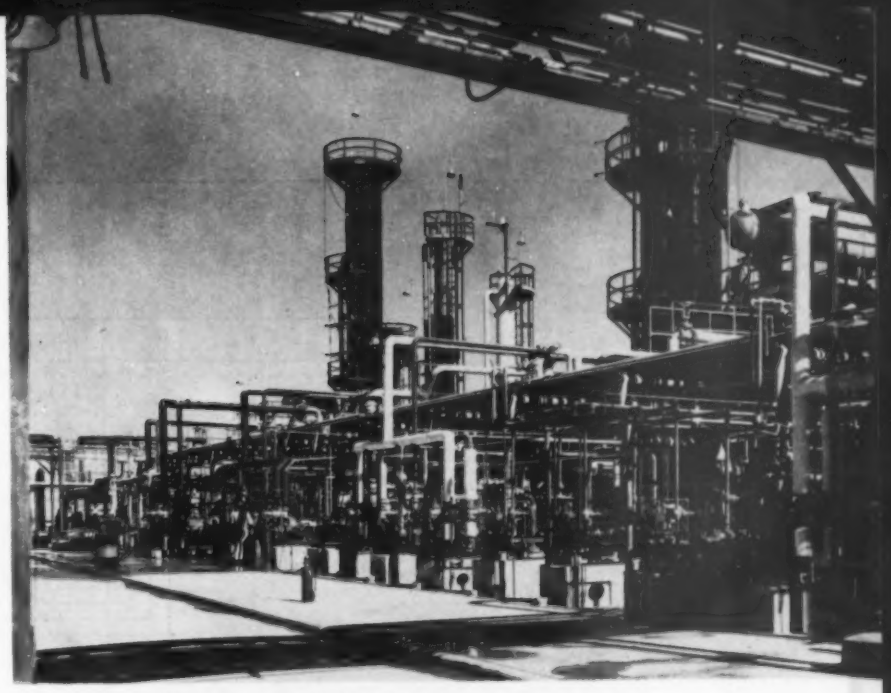
Concurrent with its expansion as a refiner and petrochemical manufacturer, Eastern States now has embarked on an exploration campaign. One field has been

discovered thus far. In addition, the company has joined with other refiners in the Houston district to build the 24-inch El Rancho Pipe Line System to bring in West Texas crude. The new line from Houston to McCamey will have a capacity of 200,000 barrels of crude per day, assuring adequate future supplies of raw material.

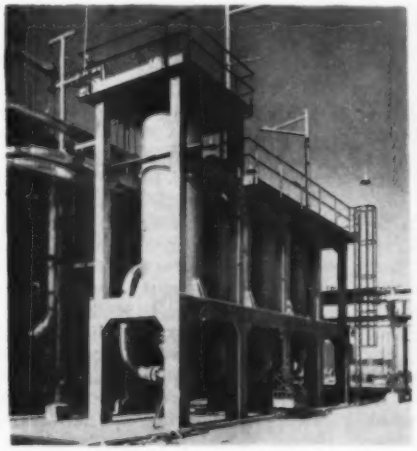
The twenty-five fold increase in output capacity of Eastern States in a period of seventeen years, the development of new products, and the expansion into production and transportation, is an expression of the vision and energy of Mr. Kahle and his associates. Despite the present size and complexity of the operation, Mr. Kahle continues to give attention to details and to inject his enthusiasm into the staff. An example of this was observed by the writer early in March at the time the company invited a large group of friends to inspect the new UOP Platforming unit which already was on stream and working smoothly. The guests were to appear at 11 o'clock for the plant inspection, but two hours before that time, Mr. Kahle and his executive vice president, R. N. Blaize, were in the plant yard personally supervising the spreading of a few additional loads of crushed shell on the parking lot and making sure that arrangements for the barbecue lunch were complete.

History of the construction of the new Platformer is another indication of the attitude of Eastern States management and the results it achieves. Contract for the unit was signed with Universal Oil Products Co. on June 7, 1951. On July 30 site preparation work was begun. By the first of September two of the towers were in place, concrete structural work was ready for heat exchangers, and heaters were in course of erection. On January 31, 1952 the new Platforming unit went on stream at its designed capacity of 4,500 barrels per day. From ground breaking to on stream in six months was accomplished in a period of national defense emergency when materials were scarce and fabricators were overwhelmed with orders and behind schedule with deliveries. The unit was built by the Eastern States staff with Universal Oil Products cooperation. Skilled field engineering, latest construction methods, and materials expediting work of exceptional character were required to get the job done in six months. In a few instances, used equipment was rounded up and reconditioned or modified to break bottlenecks.

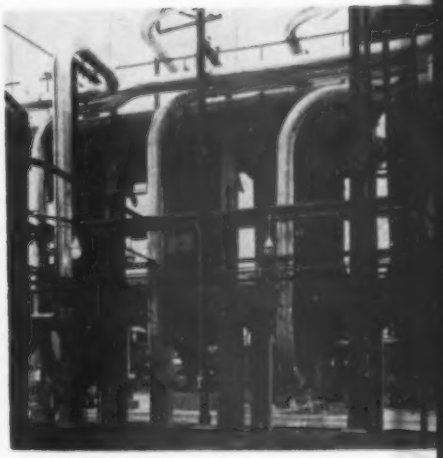
Another characteristic of Eastern States management is seen in its attitude toward throughput capacity. Early in World War II, the company erected a



View of new UOP Platforming unit showing Udex feed preparation section, gas scrubbing towers, and prefractionator.

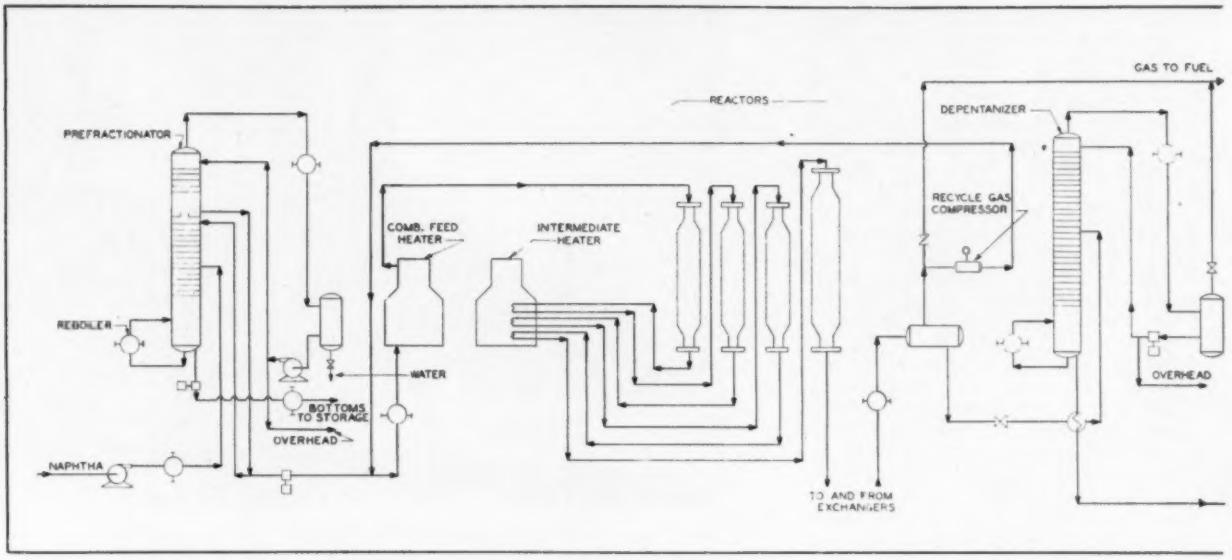


Reactor section of new UOP Platforming unit.



Back view of reactor section.

600 hp Cooper-Bessemer hydrogen compressors being installed.



Schematic flow diagram of Eastern States Platforming and Udex unit.

UOP fluid cat cracker with a rated capacity of 5,000 b/d. Today this unit is processing 18,000 b/d of raw charge. Changes in equipment were made to more than triple the former rated capacity.

The new Platformer has a design capacity of 4,500 b/d, but Mr. Kahle and his associates do not intend to run it at that rate. In building the plant, excess capacity was built into pumps, compressors, towers and heaters. It is anticipated that as a result, the unit will process 7,000 b/d of naphtha. Based on the cat cracker experience, even that figure may be conservative, but it may at least be assumed that Eastern States will try to see how much product can be made. During the first 30 days of operation, it was necessary to take one of the two recycle gas compressors out of service to make certain adjustments. The unit continued on stream without loss in throughput capacity and only a minor loss of about five percent in conversion of naphthenes.

The Udex unit, scheduled to go on stream late in March, is the first commercial unit of the process developed by Dow Chemical Co. The process is licensed by Universal Oil Products and engineering was done by UOP. As previously described in World Petroleum[1], the process employs a mixture of diethylene glycol and water as a selective solvent to extract aromatics from paraffin-aromatic mixtures. In connection with suitable fractionating equipment, the process may be employed to produce toluene, mixed xylenes and ethylbenzene as well as benzene.

The Eastern States plan is to produce benzene, at least for the present, as the only pure aromatic. This product will be sold to Dow Chemical for subsequent production of styrene. Demand is particularly strong at this time for styrene as an essential material in the production of synthetic rubber. It is also largely used in polystyrene type plastics. Styrene demand is estimated by Dr. Gustav Egloff of UOP at 750 million pounds in 1952 and at 1,000 million pounds by 1955. Benzene demand is increasing currently at the rate of 20 percent per year. In 1951 it was about 220 million gallons and the domestic supply was only about 184 million gallons. Imports made up some of the shortage. The Eastern States plant will produce at a rate of more than two million gallons per year and will add about 20 percent to the supply made from petroleum in 1951 which was estimated at about nine million gallons.

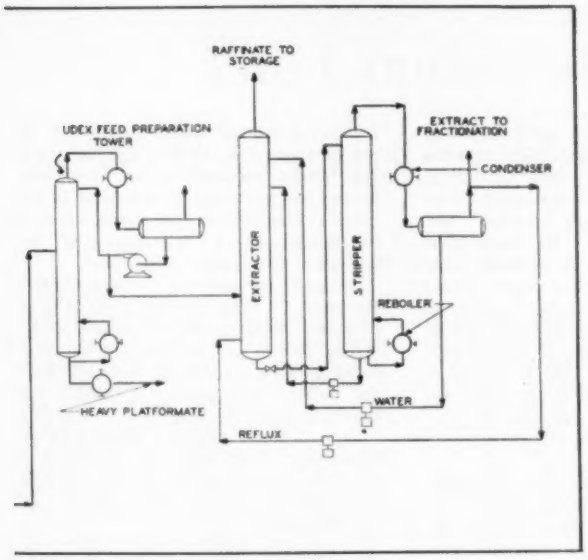
At some later date Eastern States may produce xylenes. This can be accomplished by adding additional fractionating equipment to the Udex unit. Separation of the ortho-xylene isomer from the meta-and para-xylenes can be done readily by distillation. Special methods must be employed, however, if it is desired to produce chemical grades of the remaining xylenes and ethylbenzene. Ortho-xylene is in active demand for the production of phthalic anhydride because of the acute shortage of naphthalene from coal tar sources. The more difficultly produced isomers have a great future in the synthetic fiber industry or, as mixtures, are excellent solvents.

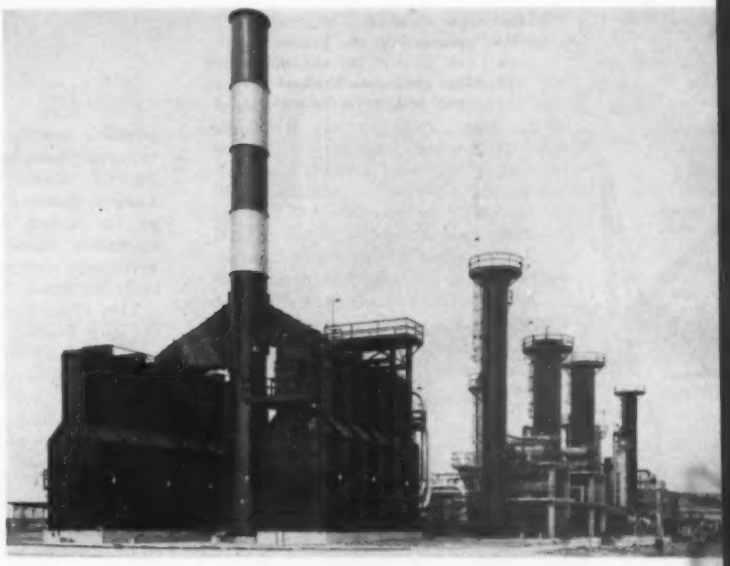
After separation of benzene from Platformate, the present plan of Eastern States is to sell the mixed aromatics to nearby refiners who are operating alkylation plants and blending aviation gasoline. Eastern States has a war-time alkylation plant which could be rehabilitated and put into service, but at this time does not have a mandate from the Government to do the necessary work.

In view of the lively demand for benzene both as a chemical intermediate and for mixed aromatics for aviation gasoline blending, it is fortunate that removal of

R. B. Kahle, president of Eastern States Petroleum Co.

[1] *Benzene from Petroleum*, WORLD PETROLEUM, Nov. 1951, p. 73.





View of entire UOP Platforming Unit.

the benzene fraction improves the quality of the remaining blending stock. With benzene removed, it is possible to further reduce alkylate requirements. With no aromatics employed in an aviation fuel, it is necessary to blend up to 85 percent alkylate and to reject C_5 and C_6 alkylates. Aromatic concentrates may be blended with the full range alkylate and isopentane to produce 115-145 grade fuel and stretch the alkylate supply more than 100 percent.

The accompanying schematic flow diagram shows the main elements of the Udex unit as installed at Eastern States. Prior to extraction, the Platformer product is fractionated in a depentanizer column. No part of the benzene is permitted to go overhead. Bottoms from the depentanizer are charged to the Udex feed preparation tower from which the benzene concentrate is removed as a top product. This fraction will contain about 25 percent benzene.

J. F. McCarthy, vice-president of Eastern States Petroleum Co.

Heart of the Udex unit is the extractor, which employs a novel tray design developed by UOP research engineers to promote intimate contact between the glycol-water mixture and the benzene concentrate. The extractor operates in the liquid phase with the glycol solvent flowing countercurrently to feed. Rich extract from the base of the extractor is fed to a stripping column in which the glycol solvent is recovered for recycling and the benzene concentrate, robbed of its paraffin content, is taken as an overhead product for final fractionation to remove undesired aromatics.

To recover any traces of glycol which might be vaporized in the stripping column, a two-phase system is established in the condenser. The water phase takes up the glycol and is returned to the extractor in controlled quantities to maintain an optimum glycol-water mixture ratio. The solubility and selectivity of the glycol are controlled by water which is mixed in specific proportions with the glycol. The fact that the selectivity and solubility characteristics of the glycol can be varied by suitably controlling the water content, and that these characteristics change comparatively slowly with temperature, allows for an almost isothermal operation. Since the solvent has a higher boiling point than the aromatics, and since this solvent need not be vaporized, the heat load is low.

The Udex unit requires no high pressure equipment since operating pressures are only high enough to maintain liquid phase conditions in the extractor. In addition, the non-corrosive properties of the glycol-water solution eliminate the need to use special alloys, and carbon steel equipment is used satisfactorily throughout the system.

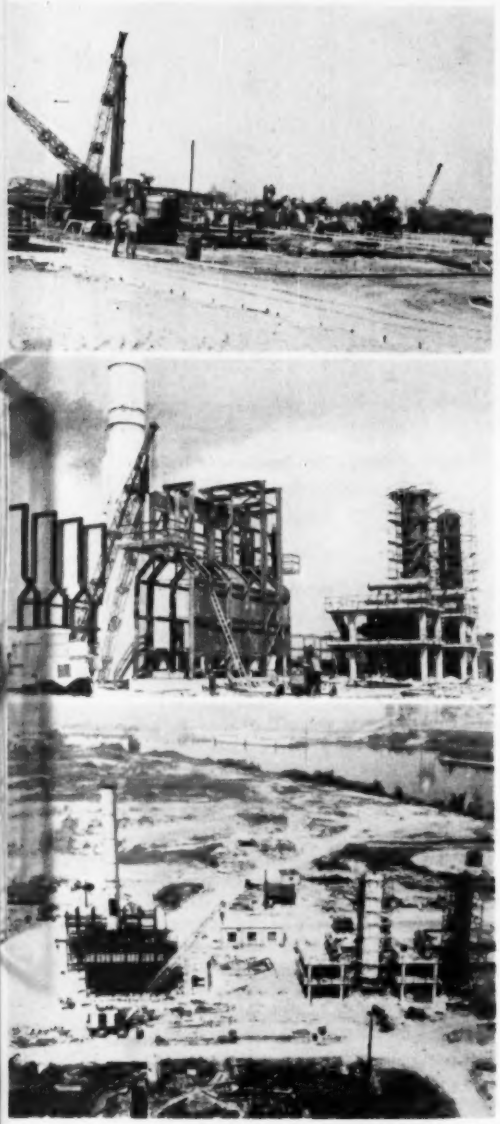
The new Platforming unit is the tenth to be placed on stream since the process was announced three years ago. Nineteen others are being designed or are in course of construction. First commercial plants[2] were designed to reform low-octane straight run naphthas to produce a high grade blending stock for the manufacture of motor fuel.

The outbreak of hostilities in Korea in the middle of 1950 and the decision of Government authorities to build up a large aviation gasoline producing capacity led to an examination of the process as a means of producing aromatics such as toluene and benzene. A test run was made at the Old Dutch plant without special equipment with the result that a high toluene yield was produced to confirm pilot plant results.[3]

For maximum production of aromatics as chemical products, it was found that certain plant modifications were desirable. Outstanding among these is the installation of a fourth reactor and an in-

[2] World Petroleum, April 1950, p. 30.
[3] World Petroleum, Feb. 1951, p. 33.

Photos below show three months' construction progress on the Platforming unit. Top, view of the site on July 30, 1951; center, on September 9; and bottom, on November 1.



crease in heater capacity and complexity to supply added heat needed for this endothermic aromatization reaction. The Eastern States Platformer is the first to go on stream designed especially for aromatics recovery. All previous units heretofore completed were installed especially for motor fuel octane improvement.

The Platforming process employs a platinum bearing catalyst and three major reactions: dehydrogenation, hydrocracking, and isomerization. Other reactions taking place are desulfurization and dehydrocyclization. When operated to produce maximum aromatics, the hydrocracking is minimized.

Originally UOP guaranteed its first licensees a run of 32 barrels of product per pound of catalyst. This was exceeded by about 50 percent on early runs, and now some units have obtained as much as 92½ barrels per pound. Much longer runs than this in the future are anticipated.

At Eastern States full boiling range straight-run gasoline is charged to a prefractionation tower. This column is used to prepare the charge, taking the light fraction overhead, consisting essentially of pentanes and lighter, and removing a bottom cut, thus leaving a naphtha fraction of controlled boiling range with an end point of 330°F. for reactor charge when running to produce aviation gasoline blending stock. The reactor charge which is taken as a sidecut from this column is pumped by means of a centrifugal pump and this stream is joined with the recycle hydrogen gas before going into a heat exchanger.

Total Platformer feed is charged to the four reactors in series. The stream is reheated to process temperature between each reactor to restore the heat loss occasioned by the endothermic dehydrogenation reaction. One of the twin heaters handles the total charge to the No. 1 reactor. The second heater operates at a light load with three coils to reheat the charge.

Gas is separated from the effluent of the No. 4 reactor and a portion of the gas is treated to remove hydrogen sulfide before compression and recycling. Excess gas not recycled is burned in the heaters. Liquid from the product separator is depentanized and then is ready for the Udex feed preparation tower.

Compressors employed are used Cooper-Bessemer V type 600 hp units with a combined capacity of 28 million cubic feet of recycle gas per day. The old compressors were fitted with new cylinders and carbon steel pistons to handle the hydrogen gas. Because of the relatively low temperatures employed, expensive high alloy steels are not required. Carbon steel is used in most of the equipment, and mild alloy steel is used only in a small part of the equipment.

Yields of aromatics from a Platforming unit depend to a very great extent on the naphthene content of the charge stock. At Eastern States about 15,000 b/d of Poza Rica crude from Mexico is currently being processed. Unfortunately the naphthene content of this stock is low, averaging around 30 percent. Other crudes, notably those from Gulf Coast fields, have naphthene contents running up to 50 percent. Recently the average charge has been about 30-35 percent naphthenes. Accompanying tables show results of inspection of charge and product during a recent run, together with processing conditions. Since stock being run currently is some 8 to 10 percent lower in naphthene content than had been anticipated, the aromatics content and rich mixture rating are correspondingly low. When the plant has available a charge stock of around 40 percent naphthenes, it is anticipated that the depentanized Platformate blended with isopentane to 7 lb. RVP will have an F-3 leaded octane number of 95 and an F-4 leaded performance number of 120.

No results are available to show the performance of the new Udex unit, as it is just going on stream as this is written. A report on early operating results will be published in an early issue.

EASTERN STATES PETROLEUM CORP. PLATFORMING UNIT
OPERATING SUMMARY—REPRESENTATIVE OF INITIAL OPERATION

Inspections	Prefractionator Charge	Prefractionator Bottoms	Reactor Charge	Depent. Rerun Plat.	Rerun Bottoms
API	64.0	47.8	58.5	53.0	32.0
IBP	96	310	165	170	212
10	148	320	195	195	295
50	222	330	230	280	338
90	300	353	340	330	490
EP	345	375			
RVP	9.7			2.0	
Aromatics	12			45.0	
Sulfur	.07		.05	.0015	
Octanes F—1+3cc	72			94.0	

Yields	BPD
Prefractionator charges	5,990
Net overhead	920
Bottoms	570
Reactor charge	4,500
Reactor charges	4,500
Stab. ovhd. liquid (C_4 and C_5)	465
Rerun depentanized Platformate	3,375
Rerun bottoms	300
Total	4,140

The Condensate Well Corrosion Problem

By H. E. Waldrip
Gulf Oil Corporation

IN ORDER to solve the perplexing problem of condensate well corrosion, which formerly cost industry an average of $3.59/MMCF of gas produced, 27 operating companies pooled their efforts to control this loss of well equipment.

Funds were contributed through the Natural Gasoline Association of America to finance research on the problem and a group known as the "NGAA Condensate Well Corrosion Committee" was organized. Technical personnel representing the contributing companies formulated plans for studying the problem.

A subcommittee was appointed to correlate the data relating to the use of inhibitors. In 1949 this subcommittee drafted a questionnaire and submitted it to representatives of the participating companies. In 1951 a more comprehensive questionnaire was drafted by the subcommittee and circulated to 28 operators. Replies were received from all but two companies, and the data furnished by these two companies during the 1949 survey was used in lieu of the more recent information. The results of the current survey are included herein, along with a recapitulation of the survey of 1949 and of one conducted by the author in 1947.

The subcommittee deemed it advisable to obtain more detailed data on methods of well completion, inhibitors used in wells completed open-ended and those set on packers, dually completed wells, and an overall picture of other corrosion control measures in current use. For this reason the number and types of alloy tubing strings utilized and the number of strings protected with baked-on coatings are also included.

Specific data on the various chemical treatments are not given in this paper, but will be found in a book soon to be published by the NGAA committee. A summary of the costs of inhibitor treatments follows:

1. The cost of treating wells completed open-ended using alkaline or neutralizing chemicals ranged from $0.06 to $1.28, with an average of $0.18 per MMCF, based on the number of wells treated.

2. Cost of treating wells set on packers, using the same type of treating agents, ranged from $0.55 to $1.62, with an average of $0.99 per MMCF of gas produced.

3. The cost of chromate inhibitors in wells completed open-ended, either chromate alone or in combination with sodium hydroxide, ranged from $0.03 to $0.62, with an average of $0.17 per MMCF of produced gas.

4. The cost of liquid organic inhibitors of the adsorptive type in open-ended wells ranged from $0.22 to $1.60, with an average of $0.53 per MMCF, based on the number of wells treated.

5. In wells set on packers, the cost of treating with liquid organic agents ranged from $0.03 to $1.00, with an average of $0.80 per MMCF, based on the number of wells treated.

6. The cost of using organic adsorptive inhibitors in stick form in wells set on packers ranged from $0.15 to $1.39, with an average of $0.82 per MMCF.

The cost for a given treatment varies considerably between different operators. Where a company has only a few wells in a particular field, the company pumper handles the treating work at no additional labor cost. In larger fields, with several wells requiring treatment, additional labor is employed, or in some cases the work is contracted.

The cost of treating corrosive condensate wells is largely dependent upon the rate of gas production. Although the amount of treatment varies proportionately with the total volume of gas production, the labor cost is fixed. Thus it may be seen that the cost of treatment per MMCF of gas is less on high producing wells. Labor costs for treating daily are naturally much higher per MMCF of produced gas than for intermittent treating.

In the case of wells completed open-ended, treatment is more economical than for those set on packers. In treating the former, the duties of the pumper are not time consuming. All that is required is the recharging of the treatment tank or lubricator, and a check of the regulating valves or pump to insure the proper rate of delivery. Where wells are set on packers, however, the duties are much more involved. First the well must be shut in and the treating charge lubricated or pumped into the tubing. Time is allowed for the charge to reach bottom, then the well is reopened to production. This shut in time ranges from 1 to 24 hours, depending upon operating policy.

It can be seen that over 70 percent of all corrosive wells are now under control, either by the use of inhibitors, coated tubing or alloy steel tubing. This is a far different picture from that confronting the industry six years ago. At that time operators were groping in the dark for some means of controlling the corrosion damage that was costing an average of $3.59/MMCF of gas produced. Considering the inflated dollar of today, this would probably exceed $5.

It is possible now to control corrosion in condensate wells with one or more of the several means at the disposal of the industry. The problem today is the analysis and selection of the most practical and economical methods available. It has only been through the wholehearted support of this group in NGAA and the National Association of Corrosion Engineers subcommittee that this problem has been brought under control in such a short period of time.

COMPARISON OF RESULTS OF THREE SURVEYS

	1947	1949	1951
Number of operators reporting	23	25	27
Total number of wells reported	1334	2055	2466
Total number wells considered corrosive	——	879	1132
Total number treated with inhibitors	232	350	591
Percent of total wells being treated	17.50	17.03	23.97
Percent of corrosive wells treated	——	39.82	52.21
Number of wells with alloy tubing	——	45	183
Number of wells with baked-on coating	——	67	81
Number of wells treated with neutralizing agents	129	111	106
Number of wells treated with chromate inhibitor	59	44	54
Number treated with alkaline-chromate inhibitor	12	3	12
Number treated with sodium silicate	——	55	7
Number treated with organic chemicals	32	137	142
Percent of treated wells using neutralizers	55.60	31.71	17.94
Percent of treated wells using chromates	30.60	13.43	11.17
Percent of treated wells using organics	13.80	39.14	69.71
Percent of treated wells using sodium silicate	——	15.71	1.18
Percent of total wells protected by all methods	17.50	22.48	32.68*
Percent corrosive wells protected by all methods	——	52.56	71.20*

* Forty-nine coated and alloy tubing strings also being treated with inhibitors, and in these calculations are considered as one well. Most of these wells are located in coastal bays. The use of inhibitor is not considered essential, but is added protection against failure in the tubing string caused by corrosion.

VENEZUELAN

The drill being used by this seismograph crew is specially constructed for use in swampy terrain in western llanos of Venezuela during the wet season.

By H. J. Struth
Petroleum Consultant, Dallas, Texas

VENEZUELA'S economy is dependent largely upon oil, but the Government has given long and careful consideration to the promotion of progress in oil development and the benefits of a prosperous oil industry to the welfare of the nation and its people. The cordial relationship existent between Government and industry, and the efforts of both to reach a common understanding of mutual problems and interests, provides an outstanding example of the workings of free enterprise and private initiative in a foreign country.

The oil companies and the Government are "partners" in Venezuela, since the operating agreements provide for a "50-50" split of the income derived from oil and gas. Existing laws governing the petroleum industry in that country clearly establish the fact that the sub-surface mineral rights belong to the Government, and may be exploited and developed only by contractual agreement, through approved concession grants. What many outsiders may not realize, however, is the fact that taxes and royalties levied on the oil companies are based upon a formula which is predicated primarily upon profits. The formula provides that taxes and royalties shall be equal to the net profits of the oil companies. Taxes in Venezuela are not "punitive" because those who administer the nation's petroleum affairs are fully conscious of the benefits that accrue to the nation through the encouragement of a progressive and prosperous industry.

It is unfortunate for the people in many foreign nations that Government and industry have failed to reach a common ground of understanding, as it exists in Venezuela. The situation prevailing in Iran today might otherwise have been avoided, had differences been resolved through mutual understanding and consideration of the problems involved. It is no mere coincidence that backward nations of the world are those whose Governments have failed to recognize the benefits that accrue through the investment of private capital and the unhampered pursuit of free enterprise.

In the past six years, the Venezuelan Government has collected from petroleum royalties and taxes about $2,260 million, which comprised about 64 percent of the total revenues from all sources.

Collections from petroleum in 1950 aggregated about $475 million, which approximated the net income retained by the oil companies. It is likely that official reports for 1951 will reveal an increase in both taxes and oil company profits of about 14 percent. Taxes and royalties paid to the Venezuelan Government now average about 87 cents per barrel of oil produced. Royalties average about 39 cents per barrel, while other taxes, including concession, import duties, and income taxes, average about 48 cents per barrel of oil produced.

Venezuela is a country with a tremendous future. The wealth created through oil and gas development has launched that nation upon a broad program of industrial expansion. Venezuela not only has brilliant plans for the future, but she is doing something about them. With the money derived from petroleum, she is building new highways, deepening her harbors, making rivers navigable, building new power plants, and creating new industrial centers.

They have a slogan in Venezuela, "Sembrando el Petroleo," which means, "Sow the Petroleum." The extent to which the monies received from oil are being reinvested in Venezuela's future is shown by the records of 1947-50. Government receipts from oil royalties and concessions taxes averaged about $180 million annually, while Government expenditures for permanent national improvements averaged about $250 million annually. Thus, for every dollar received from oil, the Government has "sowed" or "ploughed back" $1.37 in building for Venezuela's future. These expenditures are in the form of capital investments and do not include the cost of Government, which is provided by income and excise taxes.

Venezuela is one of the few countries in the world that is virtually free of foreign or internal debt. The currency of

Petroleum Agreements Promote Progress

the nation is backed by 100 percent gold, which is indeed an outstanding position in the world today. Money in circulation is well over 1,500 million Bolivars (about $460,000,000), which represents an increase over the pre-war year 1938 of 434 percent. An American dollar is now worth 3.35 Bolivars, but the exchange rate for the oil companies, by agreement, is 3.09 Bolivars per dollar. The net capital invested in the petroleum industry in that country is about $1.7 billion, which is more than double the investment in the year 1946. In the past six years, investments in the petroleum industry in Venezuela have shown an increase of $1.2 billion, indicating the degree to which the industry has expanded in recent years.

The oil companies have apparently fared well in Venezuela, despite the fact that they split their income with the Government. In 1950, the net income of the operating companies, before payment of dividends, aggregated about $475 million, which represented 41.3 percent of the gross revenue. Net returns on capital invested averaged about 28 percent, compared with an average return in the United States of about 11 percent. During the past eight years, the Venezuelan oil companies have reported combined profits, before dividends, of $1,789 million, which comprised an average annual return on capital invested of about 18 percent. The industry's best year was 1947, when net returns averaged 34.3 percent on the net investment. Dividend payments to stockholders in 1950 aggregated about $132 million, and comprised 27.7 percent of the net income. Preliminary data for 1951 indicate a probable combined net income of more than $540 million. It is likely, however, that the invested capital was increased to a substantial degree by the expansion in refining and transportation facilities.

The use of crude oil production as a divisor in computing financial returns from Venezuelan petroleum operations indicates a gross income in 1950 of $2.10 per barrel, with costs and expenses of $1.22, and an average net income before dividends of 87 cents per barrel. The net income approximates the sum paid to the Venezuelan Government in royalties and taxes.

At the close of 1950, the net capital invested by the industry represented about $3.11 per barrel of crude oil produced during the year. The summation of all taxes paid by the oil companies to the Venezuelan Government in the past eight years indicates that the Government received 52.9 percent of the income, while the companies retained an average of 47.1 percent. All taxes paid during this period, 1943-50, aggregated $2,011 million against the combined net income of the companies of $1,789 million.

While the 1943 Venezuelan petroleum laws have established the principle of a "50-50" division of the income from petroleum between the Government and the oil companies, the facts indicate that the Government has fared somewhat better than the oil companies, particularly when combined taxes and royalties are considered in relation to profits. The facts show that the cumulative differential in favor of the Government of 2.9 percent represents a cash difference of some $222 million during the period under consideration. Studies of preliminary financial and tax statistics for 1950 and 1951 indicate that the division of oil income was probably shared on a more equitable basis. In fact, for the first time since 1943, the division of income between the Government and the oil companies seems to have attained the prescribed "50-50" formula.

Income taxes paid by the oil companies in 1950 are estimated at $213 million, which represents an average tax rate of 30.9 percent. This is computed as the ratio of the income tax to the total of both the net income and the income taxes paid to the Government. All other taxes and import duties, exclusive of Government royalties and computed on the same basis, indicate an average tax rate of 7.6 percent. The government royalty averages 16⅔ percent of the market value of crude oil and natural gas. The taxable values of the Venezuelan oil companies are clear-cut; they are not complicated by multiple, pyramided federal, state, and local levies, such as those experienced by oil operators in the United States. The ability to tax is not construed as the power to destroy, since Venezuela's tax laws were conceived to promote the prosperity of both the taxpayers and the nation. Income taxes are made flexible, to fit the circumstances under which they are applied.

Following is a condensed digest of Venezuelan tax levies on the petroleum industry:

Royalty
16⅔ percent of market value (graduated on gravity basis)

Exploration Tax
2 Bolivars per Hectare

Initial Development Tax
8 Bolivars per Hectare

Surface Tax

5	Bs.	per	Hectare	for	first	10 years
10	"	"	"	"	next	5 years
15	"	"	"	"	"	5 years
20	"	"	"	"	"	5 years
25	"	"	"	"	"	5 years
30	"	"	"	"	"	balance of period.

Income Taxes
Cedular tax of 2½ percent.
Complimentary tax on graduated scale ranging up to 26 percent.
Additional tax levied in proportion to net income, to adjust total taxes to equal net income of taxpayer.

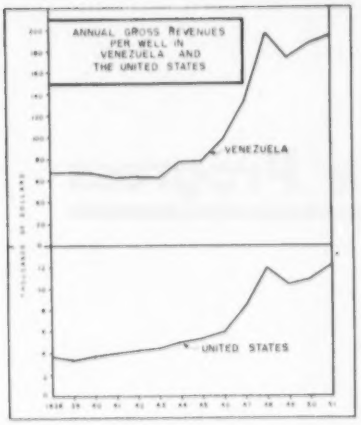
Excise Taxes
50 percent of import duty which would be paid if products were imported.

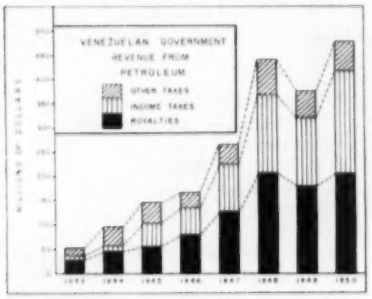
Transportation
2½ percent of charges made to others

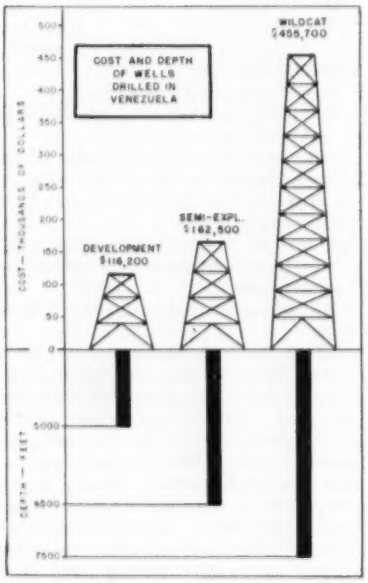
Maps
100 Bs. for each duplicate.

The oil companies have contributed richly to the progress of Venezuela and her people through the wealth created by the development of her petroleum resources. Since 1915, the oil companies have expended, through outside capital conversions in exchange for Bolivars, the huge sum of more than $4,500 million. Much of this money is today represented by new communities, highways, pipe lines, oil and gas wells, refineries, natural gasoline and cycling plants, power plants, shipping terminals, schools, hospitals, laboratories, office buildings, and many other permanent improvements. These have contributed not only to the financial well-being of the Venezuelan Government, but have created gainful employment for at least 50,000 workers and their families.

Operating costs are considerably higher in Venezuela than they are in the United States. Labor costs are higher, because







DRILLING COSTS IN VENEZUELA

	Development Wells	Semi-Exploratory Wells	Wildcat Wells
Depth, Feet	5,000	6,500	7,500
Drill. Time	33	64	182
Cost	$116,300	$162,500	$455,700
Cost per ft.	$23.00	$25.00	$60.00

GROSS REVENUE PER WELL

Venezuela and the United States

	Producing Wells End of Yr.	Annual Oil Production (Thous. Bbl.)	Production Per Well	Average Value Per Bbl.	Gross Revenue
VENEZUELA					
1938	2,656	187,910	70,749	$ .934	$66,080
1939	2,488	204,880	82,347	.803	66,125
1940	2,604	183,884	70,616	.931	65,743
1941	3,543	226,873	64,034	.977	62,561
1942	2,350	148,020	62,897	1.011	63,680
1943	2,946	179,383	60,890	1.027	62,534
1944	3,519	257,037	73,043	1.050	76,695
1945	4,420	323,403	73,168	1.057	77,339
1946	4,934	388,478	78,735	1.263	99,442
1947	5,645	434,890	77,040	1.746	134,512
1948	6,031	489,998	81,247	2.411	195,887
1949	6,287	482,299	76,714	2.252	172,760
1950 (p)	6,934	546,765	78,853	2.35	185,305
1951 (p)	7,500	622,695	83,000	2.35	195,000
UNITED STATES					
1938	369,640	1,214,355	3,285	1.13	3,712
1939	380,390	1,264,962	3,325	1.02	3,391
1940	389,010	1,353,214	3,479	1.02	3,549
1941	399,960	1,402,228	3,506	1.14	3,997
1942	404,840	1,386,645	3,425	1.19	4,076
1943	407,170	1,505,613	3,698	1.20	4,438
1944	412,220	1,677,904	4,070	1.21	4,925
1945	415,750	1,713,655	4,122	1.22	5,029
1946	421,460	1,733,939	4,114	1.41	5,801
1947	426,280	1,856,987	4,356	1.93	8,407
1948	437,880	2,020,185	4,613	2.60	11,994
1949	448,680	1,840,307	4,101	2.55	10,458
1950 (p)	461,800	1,971,845	4,269	2.54	10,843
1951 (p)	474,000	2,240,000	4,725	2.56	12,106

(p) Preliminary estimates.

TAXES AND ROYALTIES PAID BY VENEZUELAN OIL COMPANIES

(Millions of Dollars)

	1950 (p)	1949	1948	1947	1946	1945	1944	1943
Royalties	205	180	207	128	80	55	43	28
Income Tax	213(a)	140	161	94	55	46	14	6
Duties	33	30	29	22	14	11	8	6
Initial Expl. Tax	(b)	2	16	1	6	24	21	1
Annual Expl. Tax	10	11	10	10	9	9	7	8
Other Taxes	14	9	17	9	3	2	2	2
Total	475	372	440	264	167	147	95	51
Oil Prod. (Mill. Bbl.)	546.7	482.3	489.9	434.8	388.4	323.4	257.0	179.0
Taxes per Bbl.	$.87	$.771	$.898	$.607	$.430	$.455	$.369	$.285

workers are provided with housing, utilities, recreational facilities, transportation, hospitalization, etc. Under the existing labor laws, workers are normally paid for every day in the year, and also share in the profits of the companies through the payment of "utilidades." The average direct and indirect pay of oil workers is about $15 a day. Figures obtained from the Ministry of Labor place the average annual pay of oil workers at about $4,500 a year, of which about $3,000 is direct pay and $1,500 covers additional allowances and profit sharing. Over 90 percent of the employees of the oil companies are Venezuelans, and many of them hold important executive positions.

Drilling costs are twice as high as they are in the United States. A development well with an average depth of 5,000 feet costs on the average about $116,000, or an average cost per foot of $23. A semi-exploratory well with an average depth of 6,500 feet costs $162,000, at a cost per foot of $25. A wildcat well drilled to a depth of 7,500 feet costs $455,000, at a cost per foot of $60. Drilling time ranges from 33 days for a development well to an average of 182 days for a wildcat. A recent study of drilling costs revealed expenditures for drilling 25 wildcat wells aggregating over $20 million, with an average cost per well of more than $808,000, and average cost per foot of hole drilled of $74.56.

It takes a lot of money to operate an oil concession in Venezuela, but the returns are highly attractive. While competition between companies is keen, there is no such thing as competitive drilling as we know it in the United States. Under the concession plan, each company operates as a unit. There is no "checkerboarding" and "lease plays" are never encountered. Wells are drilled as they are needed, and production is limited only by the dictates of sound conservation practices. The oil operators, in cooperation

with the Conservation Department of the Ministerio de Minas e Hidrocarburos, (Ministry of Mines and Hydrocarbons) maintain a close check on the maximum efficient production of wells and the prevention of physical waste. Estimates for 1951 indicate an average daily production per well in Venezuela of 227 barrels, whereas in the United States the average per well is only about 13 barrels daily.

At the close of 1951 there were about 7,500 producing oil wells in Venezuela, each of which produced during the year an average of approximately 83,000 barrels of crude oil. The average value of crude oil was $2.35 per barrel, which indicates an annual gross revenue per well of some $195,000. In the United States, the average well produced 4,725 barrels of oil last year, which was worth $12,106. This clearly demonstrates the decided advantages of unit operation in the oil industry. In Venezuela, 7,500 wells produce an average of 227 barrels daily, while in the United States, with 474,000 wells, the daily production is limited to only 13 barrels per well. The trend of gross annual revenue per well here and in Venezuela has followed a parallel pattern, but the differential in favor of our South American neighbor presents an enviable comparison.

In these times of international political divergencies, it is refreshing to find men in government like those in Venezuela, who have a far-sighted appreciation of the benefits that accrue to their people by the encouragement of industry. Personal contact with officialdom in the country impresses one with their sincerity and purpose. While they are proudly nationalistic, and fiercely devoted to building a better and more prosperous nation, any suggestion of nationalizing the oil industry is promptly dispelled. The records of accomplishment thus far, and the constructive policies and programs for the future, provide a model that should be viewed by many other foreign nations with more than passing interest. The important point here is that prosperity of industry and the State go hand in hand. Nationalization and discouragement of private capital have never been proven successful, nor profitable, to any nation or its people.

There is room for far greater development of Venezuela's petroleum resources, which are believed to be far more bountiful than indicated thus far. With drilling and development of existing concession holdings more active today than ever before, it is likely that the Government will soon open the way to new exploration concessions. Several companies are known to be awaiting the granting of new concessions for their entry into the active exploration and development of new oil and gas fields. Some influential independent oil operators in the United States have seriously considered the prospects that may be offered by concession contracts with the Venezuelan Government. No new concessions have been granted in Venezuela since 1946, and it is believed that lack of official action in this respect has diverted attention to other areas, such as Canada and the Middle East.

Future expansion of the petroleum industry in Venezuela, coupled with intensive development of her vast iron ore resources, will undoubtedly place the nation in the forefront of the Latin American countries. The pace of social and industrial progress that has been witnessed in recent years marks a new era that is destined to make Venezuela one of the brightest spots in the Western Hemisphere.

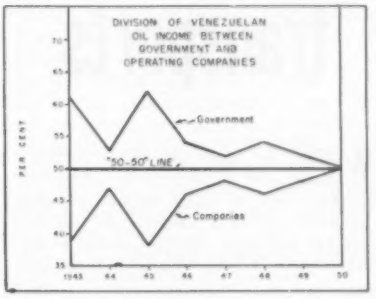
Of paramount importance to Venezuela's future, however, is the continued cordial relationship that exists between the Government and industry. As long as men in Government and men in industry can meet on a common ground in the solution of their mutual problems, there will be progress and prosperity for all.

DIVISION OF NET INCOME

(Millions of Dollars and Percent)

	1950	1949	1948	1947	1946	1945	1944	1943
Govt. Taxes	475	372	440	264	167	147	95	51
Companies	475	343	377	246	143	89	84	32
Total	950	715	817	510	310	236	179	83
Govt. Percent	50	52	54	52	54	62	53	61
Com. Percent	50	48	46	48	46	38	47	39

(p) Preliminary estimate.
(a) Adjusted to reflect payments on a current basis.
(b) About $350,000.

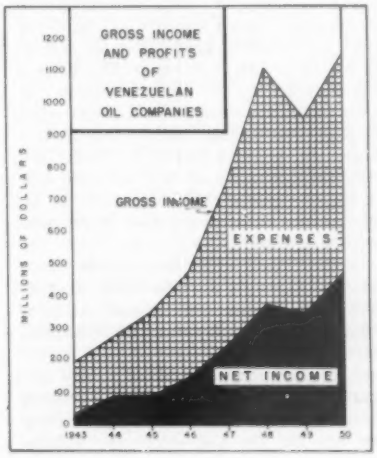


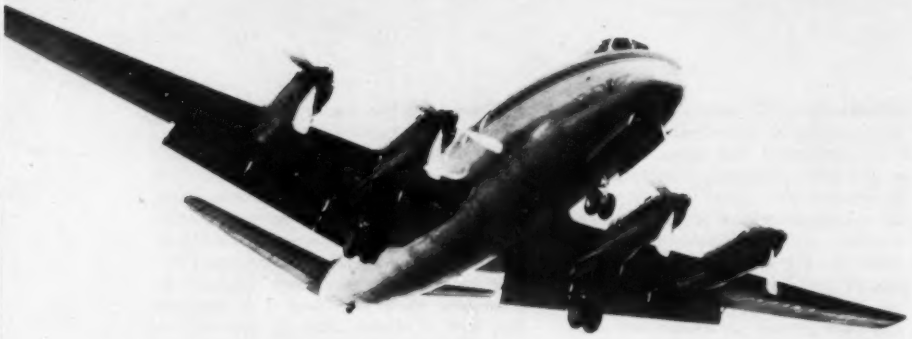
CONSOLIDATED INCOME AND INVESTMENT VENEZUELAN OIL COMPANIES

(Millions of Dollars)

	1950 (p)	1949	1948	1947	1946	1945	1944	1943
Gross Income	1,148	956	1,112	755	473	343	270	195
Net Expenses	673	613	735	509	330	254	186	163
Net Income	475	343	377	246	143	89	84	32
Dividends	132	105	114	103	69	50	62	46
Net after Dividends	343	238	263	143	74	39	22	—14
Net Cap. Inv.	1,703	1,714	1,359	717	808	646	541	477
Per Cent								
Net to Gross Income	41.3	35.8	33.9	32.6	30.2	25.9	31.1	16.4
Net on Inv.	27.8	20.0	27.7	34.3	17.7	13.8	15.5	6.7
Dividends to Gross	11.4	10.9	10.3	13.6	14.6	14.6	23.0	25.6
Dividends to Net	27.7	30.6	30.2	41.9	48.3	56.2	73.8	143.7
Dividends on Inv.	7.7	6.1	8.4	14.4	8.5	7.7	11.5	9.6
Values per bbl. of Gross Crude Oil Produced								
Gross Income	$2.10	$1.98	$2.27	$1.74	$1.22	$1.06	$1.05	$1.09
Net Expenses	1.22	1.27	1.50	1.17	.85	.79	.72	.91
Net Income	.87	.71	.77	.57	.37	.27	.33	.18
Dividends	.24	.22	.23	.24	.18	.15	.24	.26
Net After Dividends	.63	.49	.54	.33	.19	.12	.09	—.08
Net Capital Investment	3.11	3.54	2.77	1.65	2.08	2.00	2.10	2.66

(p) Preliminary estimates.





The Vickers Viscount, first turbo-prop airliner to fly commercial airways.

Consolidated Vultee's Turbo-Liner, only American plane of the type yet built.

fuels for commercial JET transports

WHILE jet fuels are still a military commodity, the day when commercial operators will be using turbine powered aircraft is drawing nearer, and the airlines are becoming more interested in the fuels they will have to use in these aircraft.

Great Britain will, within the next few months, put the world's first jet airliner, the deHavilland Comet, into operation between London and Cairo, and within 15 months these same aircraft will be flying from New York to Bermuda in the service of British Overseas Airways. The Vickers Viscount will be the first turbo-prop airliner to fly the commercial airways when it goes into regular service on British European Airways routes in 1952. Last year the prototype of this airplane flew on BEA's Paris and Edinburgh service out of London in order to test it in commercial operation.

Other airlines which have placed orders for the Viscount are the Irish Airline, Aer Lingus, and Air France. Already, BEA is flying two American-built Douglas DC-3's to which Rolls Royce Dart turbo-prop engines have been fitted. These aircraft are being used on BEA's European routes to carry cargo and are pioneering the way for the Viscounts. In 1954, or shortly thereafter, the British will introduce a second turbo-prop transport, the Bristol Britannia, twenty-five of which have been ordered by BOAC.

Britain is also building five mammoth flying boats, the Saunders-Roe Princess, which uses ten turbo-prop engines, each of which develops 3,200 s.h.p. These were intended for BOAC to use in trans-Atlantic service, but are to be handed over to the Royal Air Force for troop carrying purposes. Each Princess will be able to carry 200 troops on a non-stop flight of 3,500 miles, and should they go into commercial service, they will carry 100 passengers.

In addition to orders from BOAC for its jet-powered Comet, de Havilland has orders for this aircraft from the French carriers Air France, Union Aeromaritime de Transports and Aigle Azur, and from the Canadian Pacific Airlines. Canadian Pacific will use these aircraft on its trans-Pacific route to Australia, and it is expected Union Aeromaritime will use its three Comets on its services from Paris to Saigon and West Africa. On the basis of these orders, there will be, within the next three to five years, regular jet airliner service from London and Paris to Asia and Africa and from Vancouver to Australia. The BOAC service from New York to Bermuda will be the first jet service for the United States, but at the moment there are no plans for jet transports on routes within the country.

The aviation industry in the United States received a surprise recently when it was reported that one of the non-scheduled carriers had been negotiating with de Havilland for the purchase of two Comets which it planned to put in trans-continental service between New York and Florida. Difficulties in arranging for an early certification of the aircraft by the Federal government caused deHavilland to make the aircraft available to Air France and, as things stand now, it would be 1955 or 1956 before an American customer for Comets could expect to get an order filled.

The only progress in the United States toward a turbine-powered commercial aircraft is Consolidated Vultee's Turbo-Liner, a converted reciprocating engine transport powered by two Allinson T-38 propjet engines. Only one of these aircraft has been built, and so far its performance has not been sufficient to arouse any interest on the part of the commercial operators. Late in December of 1951, however, the first definite step toward a development program for an American designed jet transport was taken. Douglas Aircraft Company announced its intention to design a 600-mile-an-hour aircraft which would carry from 50 to 70 people. Should these designs begin early this year, it would be almost seven years before the aircraft would be in regular service on the airlines. Some of the newest reciprocating engine transports being built in America have been stressed so that they could use turboprop engines, but

The de Havilland jet-powered Comet which has made many test flights and is now being produced for British, Canadian and French lines.

it is very doubtful that this modification will ever be made on a large scale, for to get the best efficiency from the turbine engine, it would be necessary to design an airplane for it alone.

In the case of jet engines, the United States is catching up with the British and, according to some observers, the U.S. has already won the lead in this field. Frederick B. Rentschler, chairman of United Aircraft Corp., which manufactures Pratt & Whitney engines, recently pointed out that until a short time ago British designers concentrated on the centrifugal jet engine, which is simple to design and less complicated to build than other types. America, on the other hand, he said, has preferred to develop the axial-flow type engine because it can develop more power at a lower fuel consumption. This engine is considerably more complicated, but has proved its worth in the F-86 Sabre fighter in Korea. It is also the type of engine that is to go in the Series II Comets.

On the basis of the foregoing, it is evident that for the next few years at least, the largest consumer of jet fuel will be military service, and it is to be suspected that jet fuel specifications will be governed largely by the requirements of the services.

In the United States, the Air Force has been using a seven-pound Reid vapor pressure fuel defined in specification MIL-F-5624, but this fuel is being replaced by a 2-3-pound fuel as called for in specification MIL-F-5624A. Great Britain, on the other hand, has always used a kerosine-type fuel meeting British Specification Number D.Eng.RD. 2482. The properties of these fuels, as set forth in the specification, are summarized in Table 1. In the United States, the emphasis has been, almost from the inception of the turbine engine, on availability in the event of an emergency, while the British, probably because they are more concerned with defensive than with long-range offensive warfare, have favored the straight kerosine type fuel because of its good operational and combustion characteristics. Kerosine, however, is only present in crude oil to the extent of six to ten percent, a quantity which is far from adequate for the United States Air Force in an all-out war. Some idea of the relative fuel requirements of the turbine and reciprocating engine is given in Figure 1. K. C. Hunt of Esso Petroleum Co., who prepared this diagram, said ". . . it shows more clearly than any words can express how important it is that the qualitative requirements of aircraft gas turbine fuel be assessed rapidly and accurately."

It was this reasoning that led the United States to adopt specification MIL-F-5624, which is met by combining the gas oil, kerosine, and gasoline fractions into a fuel which is available theoretically in quantities equivalent to 50 percent of the production of crude. This fuel, however, was susceptible to losses from boiling, as shown in Figure 2, and a lower vapor pressure fuel, as defined by specification MIL-F-5624A, was adopted. Reference to Table 1 will show that this fuel has a more limited distillation range, the ten percent point being specified, while the end point has been lowered.

Fuel volatility affects starting; the higher the vapor pressure, the more readily it can be ignited. Improvements in ignition sources and more complete atomization of the fuel have lessened the dependence on volatility, and the trend is toward lower vapor pressure fuels, with the attendant benefits of less susceptibility to vapor lock and less fuel loss arising from evaporation and boiling at high altitudes. The lower the vapor pressure the less also is the risk arising from fire following a crash. No fuel, of course, is safe, but in terms of degree, a low vapor pressure fuel is less likely to ignite than one having a high vapor pressure.

The end point of a fuel has a pronounced effect on combustion efficiency. In a paper read before the Third Petroleum Congress in The Hague in May 1951, E. L. Bass of Shell's Thornton Laboratories reported that combustion efficiency dropped by more than 10 percent at the higher air-fuel ratios when ordinary aviation kerosine was diluted to the extent of 20 percent with residual fuel oil. Increasing the end point also increases the tendency toward carbon formation on burner liners, a condition that leads to hot spots and deterioration of the burners and increased overhaul costs. Carbon deposits also build up around the injector nozzles and interfere with atomization. This problem of efficiency and cleanly burning heavy ends may be solved as we learn more about the combustion of these fuels, but at the present time a 550-600°F. end point seems to be the limit.

Another objection to heavy ends is their tendency under low temperature conditions to deposit wax crystals in the filters. These crystals can in themselves lead to filter clogging, but they also provide a nucleus on which ice crystals form. This ice forms from water that is always present in fuel. Dissolved water may be present in concentrations up to .015 percent by weight, which is equivalent to 5.4 pounds in 600 gallons of fuel. A jet engine may burn 600 gallons an hour, which means that during an eight hour flight, over forty pounds, or approximately five gallons, of water may have passed through the lines leading to the burners.

Another property by which jet fuels are evaluated in their heat content. This is closely related to the cost per gallon and it is a cost which is of primary importance to commercial operators. Writing in the September-October 1951 issue of "Esso Air World," J. T. Hendren and J. G. Borger of Pan American World Airways said:

"We want no gold-plated btu's at a fancy price. We want a fuel that is (1) the cheapest possible, and (2) the highest possible in btu *per gallon*."

Commercial transports carry their fuel load in the wings, and it is for this reason the emphasis is on btu's *per gallon*. Because jet aircraft are high speed aircraft, aerodynamic considerations require that they have thin wings, In fact, it is expected that the wings in the turbine transport will be only one-half as thick as those in present day reciprocating engine transports.

Some idea of the necessity of watching

the btu content of the fuel closely can be gained by comparing the fuel consumption of the Comet with that of a conventional four-engine transport like the DC-6. The Comet will consume fuel at an over-all rate of about 1,000 gallons an hour at a cruising speed of 475 miles per hour. A DC-6, on the other hand, cruising at 300 miles an hour, uses 100 octane gasoline at the rate of approximately 350 gallons an hour. Roughly speaking therefore, the fuel consumption of the jet is almost three times that of the conventional aircraft, while its speed is only 1.4 times greater. To overcome this appetite for fuel, the fuel tanks on the present version of the Comet hold 7,200 gallons, or 3,000 gallons more than the DC-6. This might appear to overcome the difficulty, but we must remember that unless a jet is operating under optimum conditions, its fuel consumption is excessive. For example, if a jet is forced to fly at an altitude below optimum, fuel consumption goes up, and in climbing to reach its cruising altitude, the fuel is used at a rate that is twice as great as when the aircraft is cruising. It is reported that the Comet in climbing to 31,000 feet uses 1,300 gallons in 38 minutes.

In order to obtain as many btu's per gallon as possible, it is necessary to select a fuel of as high a specific gravity as possible, provided, of course, the fuel is not too viscous to flow freely. Aviation gasoline, for example, contains 110,960 btu's per gallon; kerosine, 125,380; and bunker C fuel oil, 144,400. Generally speaking, the higher the specific gravity the less expensive the fuel, which makes these fuels even more interesting to the airlines. So far, kerosine is the heaviest fuel that has been considered because the next heavier distillate, light diesel oil, has a freezing point of 0°F. which, under present operating conditions, is too high. Kerosine freezes at —45°F., a temperature that is considered sufficiently low for commercial operations, although the military, because of the extreme conditions under which they operate, require a freezing point of —76°F.

However, from the point of view of the commercial operator, it would be highly desirable to find means of handling and burning high specific gravity fuels in turbine-powered aircraft. He calculates his costs, and, therefore, rates, in terms of cents per ton-mile. For a large reciprocating aircraft, the direct operating cost per ton-mile is about 5.36 cents. Of this, about 1.5 cents, or 30 percent of the direct operating cost, is accounted for by fuel estimated at 16 cents per gallon. The direct operating cost of turbo-prop transport of comparable size, burning kerosine at 12 cents a gallon, is 3.85 cents per ton-mile. In this case, fuel costs per ton-mile amount to 1.36 cents, or 35 percent of the total direct operating cost. Thus, although with a turbo-prop transport burning a less expensive fuel, the direct costs have decreased over those of a conventional transport, the fuel costs have become a larger element of the direct cost.

This dependence of operating cost on fuel cost, which is even more pronounced in the case of the turbine-powered aircraft than it is for the reciprocating engine aircraft, is providing a stimulus for the investigation of the burning qualities of the heavier fuels. Hendren and Borger of Pan American have made an economic evaluation of eight fuels going from 100/130 aviation gasoline to bunker C fuel oil. They find that No. 2 fuel oil adequately meets the economic considerations. With No. 2 fuel oil at eight cents a gallon, the turbo-prop transport considered above would operate at a direct cost of 3.42 cents per ton-mile, or at a reduction of 74 percent below the cost of operating a modern reciprocating four-engine transport.

From a practical point of view, No. 2 fuel oil is deficient in storage stability and low temperature flow properties. It is also probable that it would not burn cleanly and, therefore, might lead to coking problems. These are difficulties which may be overcome, Hendren and Borger point out, by modification of the power plant installation or by tightening up of the specifications just sufficiently to permit the engine to function properly. Actual experiments in modification of the power plant to do this are in progress. From the availability standpoint, there is no problem so far as No. 2 fuel oil is concerned in the United States. Abroad, however, the picture is different, and the inherent savings in using a fuel of this type could easily be dissipated in the extra transportation and storage costs.

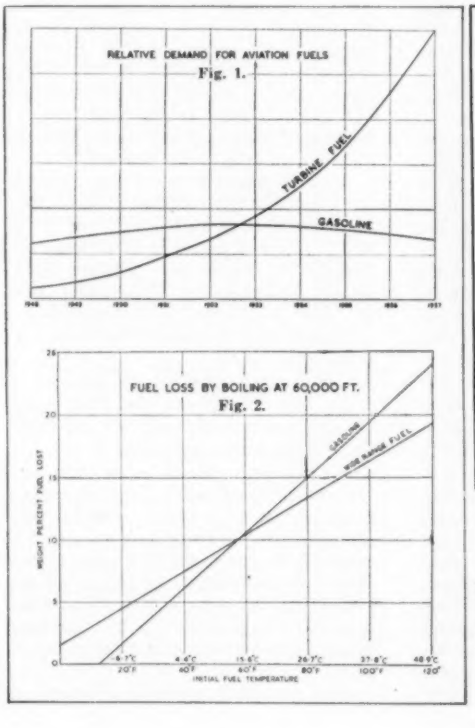


TABLE 1

SUMMARY OF TURBINE FUEL SPECIFICATIONS

	MIL-F-5624	MIL-F-5624A	(BRITISH) D.ENG.R.D. 2482
Specific Gravity	0.7275 min. 0.8017 max.	0.7275 min. 0.8017 max.	Not limited but must be determined.
Viscosity cs @ —40°F.	10 max.	10 max.	.....
cs @ 0°F.	....	....	6 max.
cs @ +100°F.	....	....	.....
Freezing Point	—76°F.	—76°F.	—40°F.
BTU/lb.	18,400 min.	18,400 min.	18,300 min.
Accelerated Gum mg/100 ml. max.	20	20	.....
Reid Vapor Pressure	5 min.	2 min.	.....
	7 max.	3 max.	.....
Total sulfur, % by wt.	0.5 max.	0.5 max.	0.20 max.
F.B.P.	600°F.	550°F.	572°F.
Percent Evaporated 10 min.	....	250°F	.....
90 max.	400°F.	....	.....

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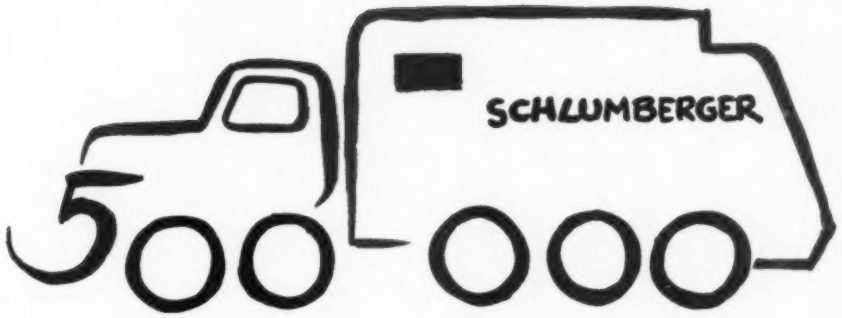

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GENERAL ELECTRIC

Morris W. Kellogg

Morris W. Kellogg, 79, founder and chairman of The M. W. Kellogg Co., died at his home, 810 Fifth Avenue, New York City on February 22. Mr. Kellogg started the company in 1901 as a small pipe fabricating shop in Jersey City. The firm turned to the manufacture of tanks for storing materials under high pressure and temperature.

From this stemmed the construction of petroleum refineries and chemical plants and the development of the first hammer-welded stills for cracking.

Early in the history of modern oil refining, Mr. Kellogg took an interest in the first cracking methods. Beginning in 1924, the company designed and constructed some 130 Cross thermal cracking units all over the world.

Shortly after 1924, Mr. Kellogg decided that the firm could not rest on fabrication and construction alone, but would have to keep developing new processes of value to industry. He established the Kellogg research and development laboratory which has expanded from one room and a couple of modest pilot plants to an organization with facilities comprehending the entire field of petroleum processing developments.

The combination thermal refinery unit which permitted the multiple use of vessels and furnaces and the elimination of intermediate piping and tankage with the whole plant operated from one control room was a Kellogg idea. The combination units, with lower investment costs and greater operating efficiency, provided the backbone of the company's business during the depression years and right up to the period just before World War II.

The company brought out a new catalytic reforming process, Hydroforming, in 1939, and during World War II, seven Kellogg-designed Hydroformers far outproduced the entire coal tar industry in supplying vitally needed toluene. Also during the wartime period, fluid catalytic cracking and the $500 million gaseous diffusion plant at Oak Ridge occupied much of the company's attention. The company has since designed and erected more than 50 cat crackers with a total daily capacity of nearly a million barrels.

A. L. Weil

Adolph Leonard Weil, 76, former president of General Petroleum Corp., died February 25 at his home in Los Angeles. He had been ill for several months. Mr. Weil became connected with the oil industry almost immediately after receiving his law degree from the University of California in 1899. In 1910 he handled the incorporation of the Esperanza Consolidated Oil Co. which later became General Petroleum. From 1934 to 1940 he served as president of General Petroleum. Mr. Weil was one of the organizers of the Kettleman North Dome Association, the first important oil field unitization effort.

Daniel T. Pierce

Daniel T. Pierce, 76, assistant to the president, Sinclair Oil Corp., died February 16 at Lenox Hill Hospital, New York after a long illness. Mr. Pierce was editor of the magazine, *Public Opinion*, from 1895 until 1905, when he entered business as advisor in public relations to many corporations. He joined the Sinclair Oil Corp. in 1930.

Norman L. Dorn

Norman L. Dorn, vice president of Lane-Wells Co., died at his home in Long Beach, Calif., March 2. He had been connected with the petroleum industry for more than thirty years. Before joining Lane-Wells in 1937, he was with Shell Oil Co. for 18 years.

W. C. Lynch

W. C. Lynch, assistant to the manager of the industrial relations department of General Petroleum Corp., died February 23. Mr. Lynch joined General Petroleum in 1916. In 1927 he was appointed assistant manager of the personnel department, later becoming manager.

Atlantic Refinery Expansion

Atlantic Refining Co. has awarded a contract to The M. W. Kellogg Co. for the design and construction of two major processing units at Atlantic's Point Breeze refinery in Philadelphia. This multi-million dollar program includes the world's largest Orthoflow fluid catalytic cracker and a sulfuric acid alkylation plant. The cracking unit will have a reactor throughput of 45,000 barrels per day, and the alkylation unit 3,500 b/d. Construction will start on both units this spring, with completion scheduled for 1953.

Expands Catalyst Capacity

American Cyanamid Co. has begun a major expansion of production facilities in its recently constructed microspheroidal cracking catalyst plant near Michigan City, Indiana. The expansion will be completed by mid-summer, raising the plant's production rate to a level sufficient for a daily 800,000 barrels of refining capacity.

Completes European Trip

Ernest W. Wilhelm recently returned from a 12-month tour of major refineries in Great Britain and continental Europe in the interest of customers of Pacific Pumps Inc., Huntington Park, Calif. He visited refineries in England, Scotland, Wales, France, Belgium, Netherlands, and Italy, as well as Pacific's licensees in England, The Netherlands and France.

Elected Chemical Construction V.P.

Mangum Webb has been elected a vice president of Chemical Construction Corp. He joined the firm in 1914 when it was founded, served as far eastern representative in Shanghai, China, from 1935 to 1936, as procurement director during World War II, then became assistant sales manager and director of engineering of the ion exchange department of American Cyanamid Co., the parent firm. Mr. Webb has been sales manager of Chemical Construction since 1949.

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BRITISH OIL NEWS

By E. Lawson Lomax

Branded Fuels Postponed

Mr. Lloyd, Minister of Fuel, announced in Parliament on February 27 that "The Government has decided that in our present financial and economic position premium brands of petrol could not be introduced. The companies have been informed."

Shell Mex B-P and the Esso Petroleum Co. had applied last month for permission to introduce branded fuels, and the Minister of Fuel had referred the application to the Petroleum Advisory Committee.

This is a disappointment both to the companies and the motoring public, who in view of the increase of refining capacity in the country, and the installation of modern catalytic cracking plants which are essentially producers of the type of products required in the production of high octane fuels, were hoping that the price ceiling on fuels would be raised, thus enabling premium grades to be produced.

At the present time two of these cat crackers are in steady production. Of others, on which erection work is well advanced, some will be in operation before the end of the year, and all should be working early in 1953.

The distribution companies had hopes of being able to market premium grades in the near future, and with this end in view had been very active in preparing plans with garages and filling stations to start this marketing at Easter, the commencement of the summer motoring season, which marketing must now be delayed until some future date, as yet unknown.

Production of Crude Oil in the U.K.

On February 23 the seven hundred thousandth ton of crude oil was produced from the Anglo-Iranian Oil Co.'s English oilfields.

Production from these fields, which are situated around Eakring, Nottinghamshire, and Formby, Lancashire, began in 1938. In that year 100 tons was produced, the peak year being 1943, when the production was 112,760 tons. Presently, production is at the rate of about 50,000 tons per year.

To Complete Vacuum Oil Co.'s Coryton Refinery in 1953

Construction of the Vacuum Oil Co.'s refinery at Coryton, Essex, has progressed steadily throughout the winter, and is now expected to be completed early in 1953.

The large amount of ground preparatory work which included many major operations is almost finished. These included the placing of more than 500,000 tons of gravel for levelling and raising the site, the driving of 10,000 piles (45'-60' long) to support building construction on land lying eight feet below high water level on the Thames, and the pouring of 40,000 tons of concrete for foundations.

Some of the main process units, which incorporate all that is modern in refining practices, are also beginning to take definite form. One of the units is a Thermofor catalytic cracking plant, the first of its type to be built in the United Kingdom.

The provision of an ample supply of water is one of the main considerations when building a refinery both for power house purposes and cooling water. In the case of the Coryton refinery, this will be drawn from the River Thames at a rate of about 45 million Imperial gallons per day.

In order to ensure continuity of supply, a water intake jetty is being built, which is a caisson of reinforced concrete weighing 4,200 tons, and designed on the "Mulberry" principle. The design and construction of this caisson has been carried out by John Laing & Co., a British firm of civil engineering contractors, on behalf of the Lummus Co. of New York and London, the principal contractors for the refinery.

For the purposes of construction, it was necessary to find a dry dock in which the bottom course of the caisson could be constructed, with subsequent work to be carried out in a wet dock. A dry dock was found at Gravesend, and in due course the partially completed structure was towed across the river to the wet dock at Tilbury where it occupied a liner berth. There construction was completed and the caisson was towed down river eight miles to Coryton, where it was sunk on a prepared bed. The total height of the unit on leaving Tilbury was 52 feet 6 inches, and it had an over-all length of 100 feet and a width of 53 feet. After sinking, the walls were raised another 4 feet.

A steel structure on box piles will be provided to carry a number of large pipes, including three of 42 inch diameter and three of 39 inch diameter, from the concrete intake to the shore, and a reinforced concrete roadway on steel work and box piles will give access to the shore from the eastern end. Together with a structural steel work and piles structure at the western end, this will serve to protect the unit and pipe structure from damage by drifting craft.

Iraq Oil Agreement Ratified

The new agreement recently signed between the Government of Iraq and the group of companies represented by the Iraq Petroleum Co., comprising British, Dutch, French, and American interests, was approved by the Iraq Chamber of Deputies on February 14 and ratified by the Senate on February 17. This final act by the Iraq Parliament concludes a friendly series of negotiations which began in 1950 between the Government and the oil interests concerned, and has resulted in the equal sharing between the Government and the oil companies of the profits accruing from the production and export of crude oil from Iraq. The terms of the agreement are retroactive to January 1, 1951.

While profits from the operations will vary on the basis of prices and costs ruling from time to time, on the basis of current estimates, Iraq's share of the profits provides for the Government an expectation of revenues from this source of £31 million 1952, rising to nearly £60 million in 1955.

Out of these revenues, the Government has announced its decision to set aside 70 percent for the projects of the Iraq Development Board, including flood control and irrigation schemes, schools, hospitals and other amenities which will raise the standard of living of the Iraq people.

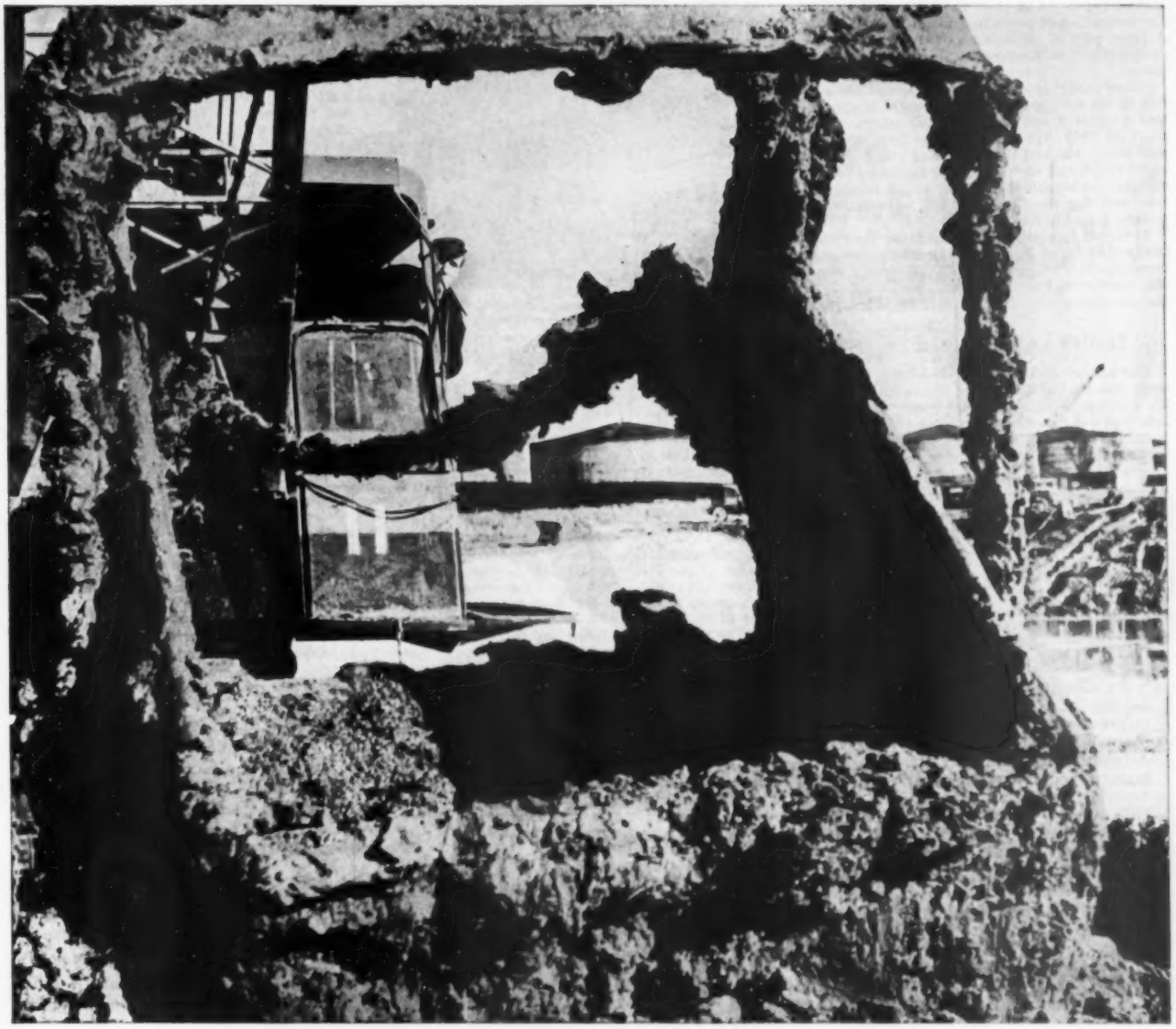
The group of companies has guaranteed to produce certain minimum quantities of crude. The Iraq Petroleum Co. and the Mosul Petroleum Co. will together produce a minimum of 22 million tons of crude oil per year from 1954 onwards, and the Basrah Petroleum Co., which has recently started production from the Zubair Field near Basrah, has undertaken to produce annually a minimum of eight million tons from the end of 1955.

The new 556-mile 30-inch pipe line from the Kirkuk field to a new Mediterranean terminal at Banias, Syria, will be put into partial operation in April. When in full operation at about the end of 1952, it will add some 14 million tons to the eight million tons already pumped annually through the existing pipe lines to the Mediterranean seaboard at Tripoli, Lebanon.

Certain clauses in the agreement assure that the total income to the Iraq Government will not be less than 25 percent of the seaboard value of all crude oil exported by the Iraq Petroleum Co. and the Mosul Petroleum Co. plus 33⅓ percent of the seaboard value of the Basrah Petroleum Co. Fluctuation of world prices is to be taken into account in ascertaining the profits to be shared between the Government and the oil companies.

The Iraq Government, as part of its 50 percent share of profits, will be entitled to take in kind at seaboard 12½ percent of the oil produced for export by the three companies, which it can

At left, the water intake for the Coryton oil refinery, after completion of the first stage of its construction at Gravesend, starts its journey across the river to Tilbury. Center, the partially completed unit is shown, escorted by tugs, mid-river between Gravesend and Tilbury. At right, the unit is afloat and construction is resumed in a liner berth at Tilbury dock. When completed the unit will weigh 4,200 tons.



PLOUGHING FOR OIL PLANT

On the marshy Isle of Grain in southern England, some 750,000 cubic yards of soil, poor for farming, are being moved in the construction of Britain's latest oil plant. On this site, Anglo-Iranian's fourth refinery in the United Kingdom is rapidly taking shape. By 1953 it will be in full operation, with a production capacity of over 80,000 barrels a day; and one more stage will have been completed in Anglo-Iranian's world-wide program of refinery expansion.

THE BP SHIELD IS THE SYMBOL OF BP THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company LIMITED

REPRESENTATIVE IN U.S.A.: W. D. HEATH EVES 610 FIFTH AVENUE, NEW YORK 20, N.Y.

either dispose of in open market or sell back to the companies at prevailing world market prices. A large part of the balance of the Government's revenue will be received in the form of income taxes.

Subject only to circumstances beyond the control of the companies, the Government is guaranteed profits of not less than £20 million (sterling) in 1953 and 1954, and not less than £25 million in 1955 and the succeeding years. In the event of production of oil being precluded by circumstances beyond the control of the companies, they will pay the Government a minimum of £5 million annually for 2 years.

Provision has been made to increase the opportunities of Iraqui nationals to participate in the development of their country's oil resources and the number of Iraqui directors on the boards of the companies will be increased.

Institute of Petroleum Meets

The annual dinner of the Institute of Petroleum was held at Grosvenor House on February 27, a company of nearly 900, made up of members and their guests, attending under the chairmanship of C. A. Southwell, President of the Institute.

SAUDI ARABIA

by Roy Lebkicher
Max Steineke
George Rentz

An area survey of the vital oil-producing Middle East, with particular reference to Saudi Arabia. The authors, all associated with the Arabian American Oil Company, discuss the history, geological characteristics, industry, communications, wild-life, government, and culture of a region that has become more and more important as a supplier of petroleum in world economy. 231 illustrations, many in full color.

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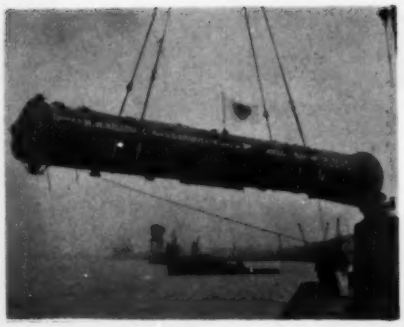

The 65-ton fractionating tower for the catalytic cracker at AIOC's Llandarcy refinery is shown being lowered into the Thames, ready to begin its tow to Swansea, South Wales.

AIOC Refineries Progress

The main tower of the distillation unit at Anglo-Iranian's Kent refinery has been erected and successfully passed all its tests, including X-Ray and pneumatic air. The tower was fabricated on site from plates brought from the U.S.A.

The reactor designed by the Kellogg International Corp. for the catalytic cracking plant at the company's Grangemouth refinery and fabricated by the Motherwell Bridge Co. has been delivered by road to the site 20 miles away. It weighs 96 tons, is 76 feet long and has a diameter of 16 feet at the wider portion.

The fractionation tower for the new catalytic cracker which was designed by the Kellogg International Corp. and fabricated by G. A. Harvey & Co., London, for the Llandarcy refinery has been towed by tug from the Thames to Swansea. It weighs 65 tons, and is 105 feet long with a diameter of 12 feet.

Anglo-Iranian has also put into commission at its Llandarcy refinery what is believed to be the first refinery unit in the world to be electronically controlled. It is a new plant for the production of premium grade kerosine and is now operating at 500 tons per day on a designed capacity of 330 tons daily.

Electronic measuring and control instruments are used exclusively in the plant for flow, pressure and level control. Operation is by the Evershed electronic system, which overcomes difficulties due to the distance between measuring points and the plant control room.

This system eliminates lags due to compressibility of air in pneumatic controls, being virtually instantaneous, so any deviations in flow, pressure or level are detected and corrected instantaneously.

Recently announced by the company is the development of a new catalytic desulfurization process called "Autofining." It operates at low pressure, and has a flexibility which enables it to handle a range of different sulfurous feedstocks.

The process has been fully proved in large pilot plant operations, and a commercial unit now in course of erection at one of the company's refineries will be commissioned this year.

Stanlow's Cat Cracker Operating

The new cat cracker at Shell's Stanlow refinery (Cheshire) is now in commercial production, turning out products at the rate of over one million tons a year. The plant cost £8 million to erect and its completion marks the final stage of Shell's £30 million refinery expansion program. Shell's refineries have now an output of 8.5 million tons per year of petroleum products.

The operation of the cat cracker will enable the chemical plant to increase its output of chemical solvents and will also provide feed stock for the sulfur recovery plant which is nearing completion, resulting in the recovery of about 10,000 tons of sulfur per year. Ultimately, other by-products from the unit will serve as raw material for the manufacture of tetraethyl lead by the Associated Ethyl Co. in its new plant at Ellesmore Port, Cheshire.

Shell Research Announces New Road Tester

Arising out of the program of extensive research carried on for many years at the three main Shell research centers in Holland, America and England on bitumen and the elastic or resilient properties of road materials, a new apparatus for testing road strength under moving loads has been invented at the Royal Dutch Shell laboratory at Amsterdam, and was shown in the Shell research exhibit at the Ninth International Road Congress in Lisbon.

The new road testing machine sets up vibrations in the construction layers which can be recorded and analyzed electrically. The information thus obtained helps engineers to assess road strength under traffic vibrations and to estimate any improvements that may be necessary. By this method tests can be carried out in situations under normal conditions of use, thus avoiding the removal of a section of the road for testing in the laboratory.

Official tests have been made in Holland by means of the one machine in existence, and other European countries are considering investigations on similar lines.

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The ECONOMICS of UNITED STATES & WORLD OIL

by E. Ospina-Racines

Member of: A.I.M.E.; A.A.P.G.; A.C.S.

A detailed study of the law of supply and demand in terms of U. S. and World oil

Being an outline and analysis of how the law of supply and demand operates in the world oil industry and how the basic economic factors governing oil supply, demand, price and time lag of the United States oil industry, the geography of the world's prospective oil land together with the oil policies, which may be identified with the various governments, establishes the conditions which promote or limit the development of the world's oil resources.

CONTENTS—CHAPTERS

1. **Pattern of the Oil Supply-Demand-Price Cycle.**
2. **Operation of U. S. and World Supply-Demand.**
3. **World Oil Demand and Markets.**
4. **Pricing Crude Oil in the World Market.**
5. **World's Undiscovered Commercial Oil Land.**
6. **Appraising Prospective Oil Land.**
7. **Conversion of Prospective into Commercial Oil Land.**
8. **U. S. and World Oil Policies.**
9. **Appendix.**

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INTERNATIONAL NEWS AND NOTES

British Columbia Active

Pipe lines, exploration, refinery additions, drilling and all phases of petroleum activity have been stepped up this Spring in British Columbia. Work has started on the Trans-Mountain Pipeline Company's line from Edmonton to Vancouver, Imperial and Standard of B. C. have announced additions to their present refinery capacity, and Imperial is already testing Alberta crude at its Ioco plant.

G. L. Stewart, president of Imperial, visiting the Ioco refinery during the tests, said he expects the $13 million addition to be finished in time for the completion of the pipe line in 1953.

Standard of B. C. recently bought 72 acres in Burnaby to enlarge its refinery which at present processes 8,000 barrels of California crude daily.

Shell Oil has expanded warehouse space and acquired additional acreage for refinery expansion in the near future.

First big sub-contract in the construction of the Trans-Mountain oil pipe line was awarded to Arrow Transfer of Vancouver. Fred Mannix Ltd., of Calgary has given a $500,000 contract involving unloading, stockpiling and stringing of pipe along 260 miles to Arrow, which expects to start work in mid-April.

Mannix has set up a main camp at Blue River to use as headquarters for the center section of the line, about 225 miles from Blue River to Coquihalla Summit. Canadian Comstock will build the Vancouver to Edmonton ends of the line. Total working force once the project gets rolling is expected to be about 2,000 men.

Shipping terminus for the pipe line may have to move outside the Vancouver Harbor area due to navigation restrictions. Semiahmoo Bay about 20 miles distant from Vancouver might be chosen.

Latest company to enter the B. C. exploration field in a large way is the United States Smelting and Refinery Co. which has 1,500,000 acres. New Continental Oil Co. has acquired 145,000 acres in the northeastern part of the province.

B. C.'s first large gas well, Pacific Fort St. John No. 3, is reported to contain 30 feet of gas-producing sand. Pacific Petroleums reported that the first two tests revealed 1,250,000 feet of gas per day. Tests were in the upper level Cadomin sand formation. Gas was recovered at the 3,616 to 3,626 foot interval. The well will be continued toward the lower Permo-Pennsylvanian layer where oil was discovered in the No. 1 well in November.

Drilling 31 wells in the Peace River area, according to J. D. Lineham, assistant petroleum controller, has cost $1,750,000. Twenty-two wells have been plugged and abandoned, five are standing cased and capped as potential gas producers, the remainder being four drillers and one awaiting further tests. A total of 330 permits has been issued for exploration on 29,534,282 acres.

1951 Burma Production

Crude oil production from the Chauk and Lanywa fields of Burma increased nearly 50 percent in 1951 to 644,841 barrels, an average of about 1,770 barrels daily.

Sales of major petroleum products in Burma in 1951 averaged 37 lakh gallons (103,000 barrels) per month. Of this, about 22 lakh gallons (63,000 barrels), was imported and the remainder produced locally.

To Modernize Refineries

Petroleos Mexicanos will spend 25,000,000 pesos on modernization of its refineries at Minatitlan, in the State of Veracruz, and at Ciudad Madero, in the State of Tamaulipas, it was announced in Mexico City by the government oil agency.

Romanian Retail Price Increase

Retail prices on oil and oil products have been boosted an average of 80 percent in Romania to cover increased nationalized transport costs, according to the government. At the same time, all former rate concessions to special customers have been abolished.

At the Targoviste oil field, reactivated during 1947 after it had been declared unproductive during the middle '30's, production without regard to cost has been ordered by the government. Soviet Director Metamekow has uncovered new small deposits below the pre-war ones, from which the Soviet-Romanian Petrol Co. derives 100 tank-wagons per day.

USSR Expands Refinery Capacity

Capacity of oil refineries in Soviet Russia was increased 120,000 b/d in 1951, according to a recent statement of Engineer Samokolsky of the ministry for the oil industry. In recent years the industry has increased its crude producing capacity an average of about 90,000 b/d each year.

Wells drilled to 10,000 feet now are commonplace, Samokolsky reported, and some have been drilled to 13,000 feet and below. Drilling rigs are being reequipped with rotary and turbine equipment and automatic drilling control instruments. The techniques of drilling offshore wells have been improved.

Deeper drilling has permitted the discovery of large new deposits in the central Volga regions, the Caucasus, Kazakhstan, Turkmenia, and elsewhere.

The engineer told a meeting at Moscow University that Soviet oil engineers have developed a "new science of hydro-gas dynamics." The problem of recovering substantial quantities of oil from old fields by secondary methods is being tackled.

Romanian Gas Rationed

Natural gas consumers in the Cluj region and in the City of Cluj, Romania are limited to a seven hour daily period of heating; hospitals to nine hours; and cinemas, theaters, and other such establishments to seven hours by Decision No. 79 of the State Supply Commission. Prices for oil products have been revised in accordance with the monetary reform of December, 1951. At a rate of 150 lei to the dollar, one U.S. gallon of gasoline now costs 12.95 lei, or 8.6 cents. Kerosine is priced at 1.85 lei per gallon and one cubic meter (35.31 cubic feet) of methane gas for household use at 0.10 lei. The average monthly income in Romania is $35.00.

Oil Line Through Andean Tunnel

Proposal that oil from the Peruvian Amazon basin be piped to the Pacific Coast through a pipe line laid in an irrigation tunnel has been advanced by Dr. Antunez de Mayolo, Peruvian engineer. The line would pierce the Andes at an elevation of about 3,300 feet instead of the 8,300 feet which would be necessary if surface elevation were followed.

As early as 25 years ago, it was proposed to drive an irrigation tunnel through the mountains to bring water from the eastern slopes to the rich but arid west. It has been estimated by Dr. Mayolo that a $20 million tunnel would irrigate 100,000 hectares of land and develop 220,000 hp. The Peruvian Congress is considering an appropriation to make preliminary studies.

Dr. Mayolo proposes to divert the Chamaya river at the mouth of the Huancabamba river by two tunnels totaling 34 miles to Olmos. Tunnels would be from 53 to 59 inches in diameter. By placing the oil line in the irrigation tunnels, the Oriente fields could be reached with a 650-mile pipe line which could be operated more cheaply because of the lower altitude.

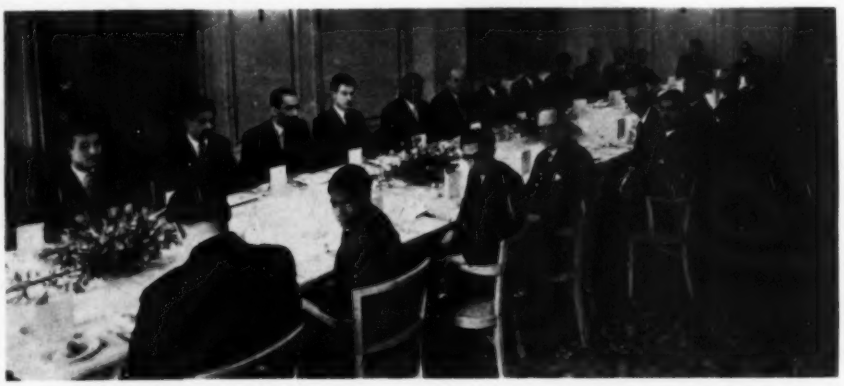
Build Gas Line in Mexico

A new gas pipe line from Xicalango field to Ciudad del Carmen, in the State of Campeche, will be inaugurated in the near future, it was announced in Mexico City by Senator Antonio J. Bermudez, director of Petroleos Mexicanos. The line will connect Xicalango, site of Mexico's pioneer offshore well, with Ciudad del Carmen industries, approximately 17 kilometers distant.

Kuwaiti Students' Gathering in London

To celebrate the second anniversary of the accession of the Ruler of Kuwait, His Highness Shaikh Abdullah as-Salim as-Sabah, the Kuwait Oil Co. invited all Kuwaiti students now in England to a gathering held in London during the weekend of February 22. Saturday was a full day. In the morning the students visited Battersea power station. After a luncheon party they went to Twickenham to watch a Rugby football match, Harlequins versus the Royal Navy. After dinner the students were taken to the theater.

On Sunday, a luncheon at which the Kuwaitis were hosts was attended by C. A. P. Southwell, managing director of the Kuwait Oil Co., H. T. Kemp, London representative of His Highness, and members of the oil company's staff.



Kuwaiti students observing the accession of His Highness Shaikh Abdullah as-Salim as-Sabah.

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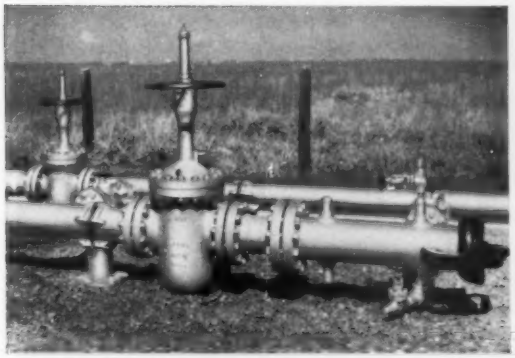

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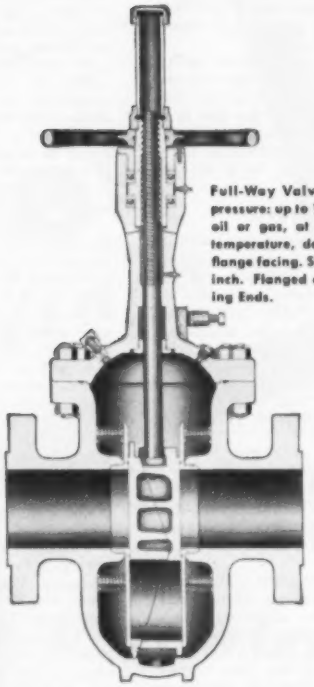

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Oil Law Signed

Peru's new "50-50" petroleum law was signed on March 13 by President Manuel Odira. As described previously (WORLD PETROLEUM, Jan. 1952, p. 57) the new law is patterned somewhat after the Venezuelan statute and is intended to stimulate foreign investment in oil search.

Debate has been extensive on national policy with respect to oil, as some elements have wanted operations largely restricted to Peruvian nationals. President Odira defended the law in a radio address after signing the measure. He asserted that foreign capital and technical skills are necessary if oil reserves are to be developed.

TCC Unit for Brazil

A Thermofor catalytic cracking unit with a nominal capacity of 25,000 barrels a day is being built in Brazil by Refinaria e Exploracao de Petroleo Uniao S. A., an enterprise capitalized at $16,500,000 and headed by Alberto and Bento Soares Sampaio, brothers with large industrial interests in Brazil. The new refinery will be located at Capuava, in the municipality of Santa Andre, 20 miles from Sao Paulo. Crude will be supplied by a 50 mile pipe line from Santos. Hydrocarbon Research, Inc., of New York City, is the contractor.

Pemex Obtains Loan

Mexico's National Savings Fund has granted a 173,454,000 peso credit to Petroleos Mexicanos for construction of a lubricant and paraffin plant at Salamanca.

First payment was 13,750,000 pesos. The fund, which is financed through the sale of national savings bonds, will deliver an additional 150,000,000 pesos to Pemex throughout this year at the rate of from 12 to 13 million pesos a month.

Pemex is obligated to repay the loan in ten years. It is estimated the 2,000-barrel lubricant plant will be operating by April of 1954. Mexico consumed 1,900 d/d of lubes in 1951.

To Enlarge Australian Plant

Vacuum Oil Co. Pty., Ltd., has revised its recently announced refinery construction plans and announced that the Altona (Melbourne) plant will be much larger than originally contemplated. It now is planned to spend about $30 million, about 50 percent more than was announced last August.

At present the Altona plant has a capacity of 1,800 b/d. The construction schedule, slated for completion in 1955, provides for installation of crude distillation, catalytic cracking, reforming, and treating facilities which will enable the refinery to process a total of 22,000 barrels per day. The expansion will add gasoline and other fuel products to the current production of lubricants, asphalt, and diesel fuel.

When completed, Altona, in effect, will be a complete new refinery located on property adjoining the existing plant. The design will be sufficiently flexible to permit processing of a variety of crude oils, including New Guinea crude on which the present small refinery operates. The new installation will be linked by pipe lines to Vacuum's deepwater products terminal at Yarraville and to the Melbourne Harbor Trust's new crude-discharging facilities at Williamstown, both in the Melbourne area.

The expansion at Altona is the third major addition to the Standard-Vacuum organization's refining capacity announced in the last 14 months. These additions represent an investment of $82 million and an increase of more than 54,000 b/d in the company's crude runs to refineries.

CARLOS PEREZ DE LA COVA, minister counselor for petroleum affairs of the Venezuelan Embassy, Washington, D. C., has advised Governor Sid McMath of Arkansas, chairman of its Interstate Oil Compact Commission, that Venezuela has accepted an invitation to become associated with the Compact Commission. Venezuela is the second foreign government to affiliate with the Commission, the first being the Province of Alberta, Canada, which came into the Compact as official observer during 1947.

May Export Sulfur

Mexico will soon become a sulfur exporter as the result of present plans to expand output, it was produced by Pemex's Poza Rica and Cerritos guello C., president of the Economy Ministry's sulfur control committee. Last year 50,000 tons was produced by Pemex's Poza Rica and Cerritos plants. January figures show the Pemex unit is turning out 125 tons daily and Cerritos, 35 tons. Arguello's optimistic outlook is largely based upon possibilities for development of new sulfur fields on the Isthmus of Tehuantepec; Jaltipan, in the State of Veracruz; and Mexicali, in the new State of Lower California.

Bulgaria Suffers Fuel Shortage

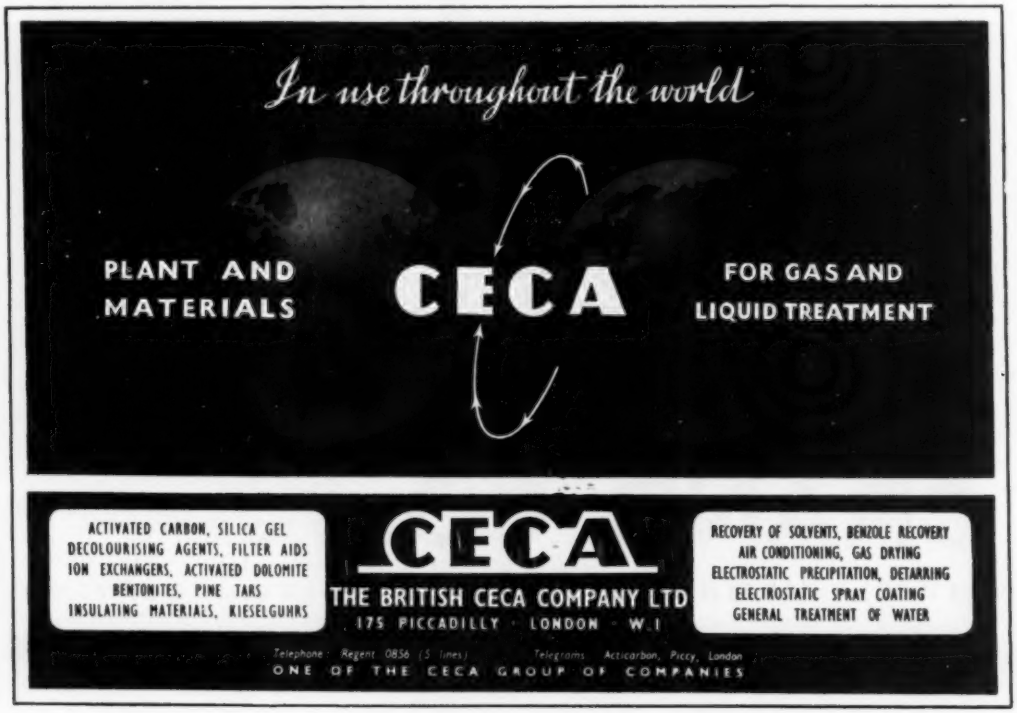
Nova Makedonija, the organ of Macedonia's People's Front, describes the shortage of gasoline in Bulgaria as increasingly acute. A temporary stop or complete cessation of traffic is expected.

Operations of all automobiles, buses, and trucks of the state's Traffic Enterprise in Sofia had to be suspended for one week in November for lack of fuel. The paper suggests that the building up of gasoline reserves for Bulgaria's military use has brought about the shortage.

Build Catalyst Plant in Germany

Construction of a plant to manufacture bead catalyst for Thermofor catalytic cracking (TCC) units in Europe is underway at Nienberg, near Hanover, Germany. The Kali-Chemie Co. has been licensed to build and operate the catalyst plant.

There are now 11 European TCC units completed or building. A 15,000 barrel unit went on stream last year at Frontignan, France. Ten TCC units, in addition to the one at Frontignan, are now planned for Europe and one is planned for Morocco.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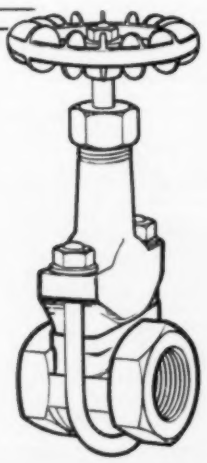

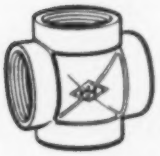

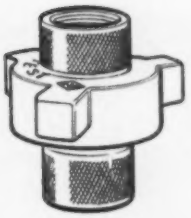

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OIL COMPANY STAFF CHANGES

R. L. KEYES has been elected president and director of the Arabian American Oil Co., it was announced by F. A. Davies, chairman. Mr. Keyes has been associated with the oil industry since 1919. After doing geological work in Oklahoma, Texas, New Mexico and Kentucky, he joined the Texas Co. in 1928 as a petroleum engineer. He served in various executive capacities and last year was made assistant general manager of the Texas Company's producing department, with headquarters in Houston.

PAUL L. KARTZKE has been appointed a vice president of Shell Oil Co. of Canada, Ltd., and area manager in charge of exploration and production in western Canada, with headquarters in Calgary.

He succeeds E. G. Robinson, who will retire at the end of May after 27 years with Shell. Mr. Kartzke has been Rocky Mountain division manager, where he guided Shell operations that led to important discoveries in the Williston Basin across the U.S.-Canada border.

Shell's exploration and production activities in western Canada have been greatly expanded under Mr. Robinson in the past three years. Currently there is an active wildcat drilling program, and at the Jumping Pound gas field in Alberta, a new gas treatment plant has been built for processing natural gas for home and industrial use.

EDWIN E. ESMAY has been appointed acting director of the Oil Industry Information Committee of the American Petroleum Institute to serve during the absence of H. B. Miller. Admiral Miller was granted a leave of absence to become president of the National Committee for A Free Europe. In this new job he succeeds C. D. Jackson, publisher of Fortune magazine.

Mr. Esmay has been industry liaison representative of Standard Oil Co. (N.J.) since 1946. He has been identified with OIIC since its formation and previously served the API as acting director of information. He was associate editor of *Fuel-Oil Journal* from 1933 to 1938 and served the Petroleum Industry War Council and PAW before he entered the U. S. Navy to serve three years in the Pacific. Mr. Esmay is on leave from Jersey Standard for the new assignment.

ROY O. CAMPBELL has been appointed chief chemist of The British American Oil Co., Ltd. He joined B-A in 1931 as resident chemist at the Toronto refinery. Since 1949 Mr. Campbell has been technical assistant in the marketing department.

CHARLES A. PERLITZ, JR., Houston, vice president and general manager of the southern region of Continental Oil Co., has been placed in charge of transportation, crude oil trading, purchasing and public relations activities. In addition, he will serve as chairman of the company's financial advisory committee, and act as liaison with subsidiary and affiliated pipe line companies.

Continental's southern region was divided on April 1 into two regions. O. L. Fisher, Houston, assistant general manager of the present southern region, has been promoted to general manager of the revised southern region. K. W. Brill, Denver, manager of exploration in Continental's Rocky Mountain region. has been promoted and will move to Houston as assistant manager of the southern region.

Heading the new southwestern region, with headquarters at Fort Worth, will be H. H. Hinson as regional general manager and George W. Evans as assistant regional general manager. Prior to promotion Mr. Hinson was assistant manager of Continental's production department, Houston, and Mr. Evans was manager of transportation and purchasing, Houston.

MICHAEL L. HAIDER, deputy production coordinator of Standard Oil Co. (N.J.), became president of the American Institute of Mining and Metallurgical Engineers at their annual convention in New York City on Feb. 19. He was a vice president and director last year. He has served various Jersey companies since 1929 when he joined Carter Oil Co., of which he became chief engineer in 1936. Two years later he was made manager of production engineering and research for Standard Oil Development Co., New York. In 1945 he transferred as executive assistant in the producing department of Standard Oil Co. (N.J.), and the following year joined Imperial Oil Ltd., Toronto, as head of the producing department. He was elected a director of Imperial in 1948 and vice-president in 1950. He returned to Jersey Standard on March 1 this year.

DR. D. M. MORRISON of Shell Oil Co. of Canada has been appointed director of the petroleum division of the Canadian Department of Defence Production. He was formerly manager of the Shell Montreal refinery, and is on leave of absence from Shell. During World War II he served with the Department of Munitions and Supply in the explosives and chemicals production branch. For his work in this branch, Dr. Morrison was awarded the M.B.E.

DOUGLAS R. KRAMER has been appointed advertising manager of the American Meter Co. He has been with the company since 1944 in research and development work. For the past few years he has been instrumental in the publication of the company's technical literature. He is an instructor in the measurement short courses held annually at the University of Oklahoma and West Virginia University. Prior to joining American Meter, he was with Standard Oil Co. (N. J.) designing installations and equipment for process control.

R. W. BAKER, marketing analyst for Shell Oil Co., has been promoted to manager of the research and analysis division of the marketing administrative office. J. E. Morehouse, supervisor of methods and procedures, becomes manager of his division.

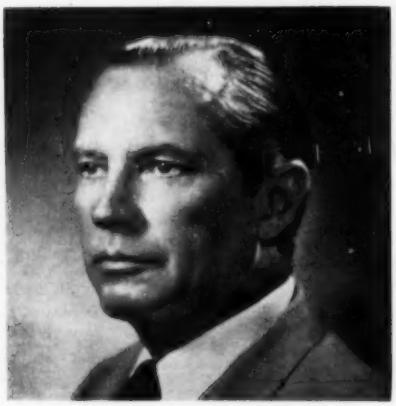
Mr. Baker will be responsible for general marketing research, analysis of marketing expense and sales trends, coordination of forecasting, and special marketing statistics. He began his career as a clerk in the head office in 1941. Mr. Morehouse's new duties include the handling of price records, studies of marketing organization, handling of government bids, and coordination of marketing service procedures. He started work with Shell in 1937 as a junior salesman.

J. J. STATLER has been elected executive vice-president and director of the Canadian Atlantic Oil Co., Ltd.

He was formerly manager of the exploration department for Western Canada of British American Oil Co., Ltd. Prior to coming to Canada in 1947, Mr. Statler was engaged in the petroleum industry in the United States with the Continental Oil Co. and British American Oil Producing Co.

Canadian Atlantic Oil Co., Ltd., resulted from the recent merger of the former Atlantic Oil Co., Ltd., Princess Petroleums (1950) Ltd., and Allied Oil Producers Ltd.

LEROY D. STINEBOWER, formerly of the United States State Department, has joined Standard Oil Co. (N.J.) as assistant to the treasurer. Mr. Stinebower has been in Washington since 1934 in various positions, most recently as director of the Office of Financial and Development Policy. He has participated in a number of international conferences and from 1946 to 1949 was the deputy representative of the United States in the United Nations Economic and Social Council and the United States member of the United Nations Economic, Employment and Development Commission.



R. L. Keyes

C. A. Perlitz, Jr.

D. R. Kramer

A Saudi Arab on-the-job trainee compares notes with an American engineer at the Arabian American Oil Company's Ras Tanura refinery. This Saudi Arab is one of many hundreds who are quickly being advanced to jobs of more responsibility through Aramco's industrial training program.

Arabian American Oil Company

NEW YORK DHAHRAN

H. L. Hawkinson, Jr.

Bethlehem Promotes Hawkinson

H. L. Hawkinson, Jr., has been appointed assistant chief engineer of Bethlehem Supply Company's manufacturing division. Harvey E. Davidson is chief engineer. Bethlehem manufactures oil well drilling and production equipment in its two plants at Tulsa, Okla., and Corsicana, Texas. Mr. Hawkinson has been with Bethlehem since 1940, except for his naval service in the Pacific during World War II. In his new position he will be located at Tulsa to assist in the development and design of drilling and production equipment. He will specialize in the application and use of the equipment in the field, and in its modification or improvement.

RICHARD K. HUEY has resigned as production vice-president of Deep Rock Oil Corp. He will conduct an advisory and management service for oil and gas development and operation. In addition he is organizing the Cimarron Gas Co., which will operate a gas transmission system in Payne and Lincoln counties, Oklahoma. This gas system supplies Deep Rock's Cushing refinery and other industrial and private accounts. The Cimarron system has approximately 50 miles of line and receives gas from a number of fields along its route. Mr. Huey has been identified with Deep Rock production activities for 31 years.

WILLIAM L. HORNER, petroleum engineer for Sunray Oil Corp., will be manager of a new department to be established by the company for the control of reservoir engineering and repressuring operations. He has been with the company since 1943. Currently he is chairman of the engineering committee of the Scurry Area Canyon Reef Operating Committee now in the process of setting up a unitization agreement for fluid injection repressuring in the Kelley-Snyder and adjacent fields in Scurry County, Texas.

JOSEPH F. McCARTHY has been appointed assistant division superintendent for Humble Pipe Line Company's Southwest Texas division, with headquarters in Corpus Christi. Francis W. Leary and William W. Brooks were named district superintendent and assistant district superintendent, respectively, for the company's Alice district. All three men joined Humble Pipe Line Co. in 1927.

T. C. BODLEY, formerly manager of crude oil purchasing and sales for Sunray Oil Corp., has been transferred to Corpus Christi, Texas, to be coordinator in the building of the company's new refinery in the Gulf Coast city. He is succeeded by P. M. Broach, formerly manager of the crude oil trade and exchange section for Stanolind Oil & Gas Co.

T. N. Shults

Named Export Manager

T. N. Shults has been appointed export manager for Mid-Continent Supply Co. at New York. He has been in New York since 1947 as export sales engineer and assistant export manager. Mr. Shults joined Mid-Continent in 1939 and worked in the Fort Worth purchasing department until leaving for the Army in 1942. Upon returning from service in 1945, he was transferred to the sales department.

IRA H. CRAM has been elected a director of Continental Oil Co. to succeed W. H. Ferguson, retired. Mr. Cram is vice president in charge of exploration. He joined Continental on Jan. 1, 1949, after 25 years with Pure Oil Co.

MILLENNIUM-KEY

PETROLEUM FITTINGS

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Cast Steel Fittings for oil refinery and chemical plants are manufactured throughout at Braintree by Lake & Elliot Ltd. Close metallurgical control is maintained by competent chemists working with modern apparatus. The independent inspection department can carry out inspection, or work in conjunction with customers own inspectors.

Lake & Elliot Ltd.

BRAINTREE ENGLAND

Offshore Drilling Resumed

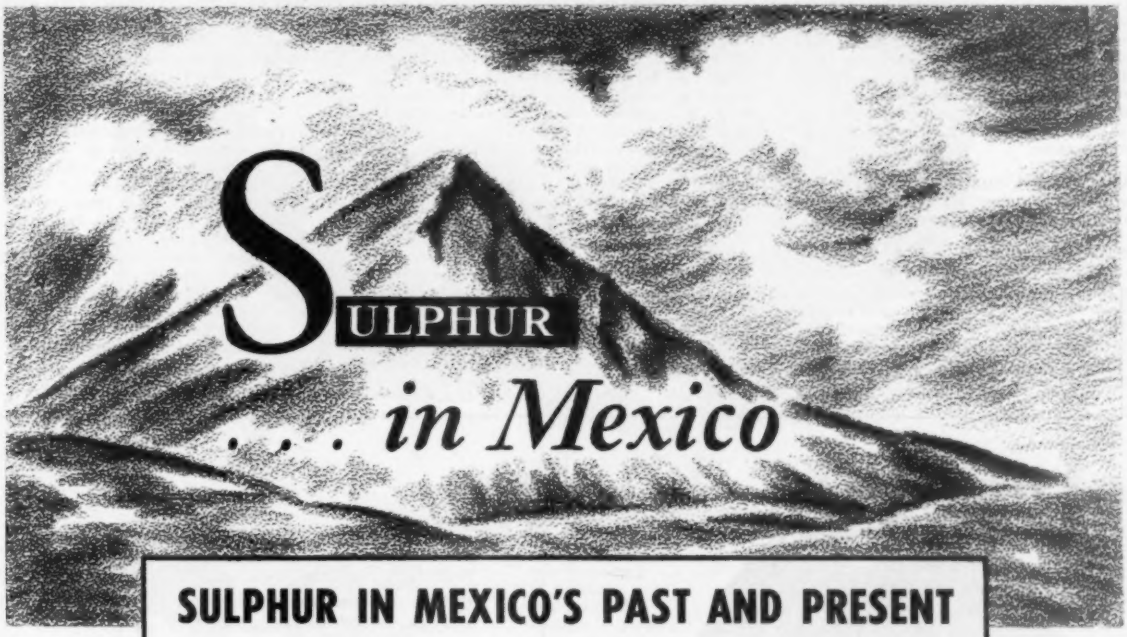
(Continued from page 37)

or the U. S., is up in the air, but the Canadian crude oil could be used in either event, says PAD. For the time being, however, the West Coast is so short of crude oil, with the military taking 40,000 b/d of its West Coast needs from the Gulf Coast, that the PAD is urging opening of the Elk Hills Naval Reserve, California.

The Independent Petroleum Association of America asked Congress in March to take off price controls over crude oil and natural gas. The IPAA indicated it would be happy, however, with a marked price increase instead. The IPAA, representing producers in all states, says the supply of crude oil is adequate, so there would be no "runaway" price increases. It also argued that a higher price, 42 cents higher this year and 30 cents more next year for each barrel, is needed if the new oil well targets of defense agencies are to be met. The PAD has set a 55,000 well goal next year, against 44,000 last year. To pay for the drilling, says IPAA, we will need more crude oil income.

The producers face an uphill fight. While the Congress and the Office of Price Stabilization want to take off some price controls, they are thinking only of commodities selling below ceilings. If they were to take off crude oil price ceilings, the rest of the oil industry would want ceilings removed from gasoline and fuel oil and other products, and wage controls would have to go too. Nor do the Congressmen see how they could, in fairness, take off ceilings from crude oil, and leave them on such other basic commodities in the economy as beef, groceries and steel.

A report of the National Petroleum Council last month, foreseeing adequate crude oil ahead, and oil shale and coal as sources of gasoline if that runs out, sounded new, but not to A. P. Frame, associate deputy head of PAD. In 1866, he says, seven years after the birth of the modern oil industry, the U. S. Revenue Commission wrote a report entitled "Petroleum as a Source of National Revenue." Written decades before L. F. McCollum, author of the NPC report, was born, the revenue report thought it "reasonable to suppose there will always be sufficient oil for the wants of this country." But if crude oil runs out, "an ample and permanent supply of oil will be obtainable from shale and bituminous coal from all parts of the United States in great abundance." "Which all goes to show," says Mr. Frame, "the most dynamic industry of all has a base of stability after all."



SULPHUR IN MEXICO'S PAST AND PRESENT

More than four centuries ago, Captain Diego de Ordaz found sulphur in the now famous volcano of Popocatepetl* at an altitude of 17,000 feet. The sulphur was used for gunpowder by Hernan Cortes for the conquest of Mexico.

Today, the uses of sulphur are manifold . . . and the extent of the use of sulphur is a measurement of a nation's industrial progress.

In Mexico, annual consumption of sulphur per capita doubled between 1946 and 1950.

Petroleos Mexicanos is helping the nation's industrialization by producing 120 tons of elemental sulphur daily from natural gas processed at the Poza Rica field—in the second largest sulphur recovery plant of this type in the world.

As a net producer of sulphur, Mexico's oil industry serves other industries . . . accelerates a national progress that means better living.

*Means "Smoking Mountain." Previous to its eruption, was known as "Xaliquehuac," meaning "Sandy Mountain."

PETROLEOS MEXICANOS
MEXICAN PETROLEUM ADMINISTRATION

T. E. Kraner

F. A. Gehres

Cooper-Bessemer Opens New Orleans Office

A combined regional office and warehouse has just been established at New Orleans by the Cooper-Bessemer Corp. under the direction of T. E. Kraner, branch manager. New facilities now provide direct factory representation for all engineering service requirements on engine and compressor applications. In addition, the new warehouse stocks essential parts for servicing marine and industrial installations currently operating in the southern Gulf Coast area. Working directly with Mr. Kraner is F. A. Gehres, assistant branch manager.

Plans Tank Consulting Work

Charles L. Marner, formerly vice president in charge of sales for Graver Tank & Mfg. Co., Inc., has announced that he is no longer associated with that company. Although his future plans are not fully developed, he intends to enter the consulting field dealing with the fabrication of petroleum storage facilities. His past experience in the development of vapor conservation equipment extends over a period of many years. For the present, Mr. Marner is enjoying an extended vacation on his Crown Point, Ind., farm.

Larger Oil Line Planned

Cities Service Pipe Line Co. will build an 18-inch oil pipe line from Sour Lake, Texas, to the Lake Charles, La., refinery of Cities Service Refining Corp. The new line will have a daily capacity of 150,000 barrels and will parallel the company's present 12-inch line. It will connect with the projected West-Texas-Gulf line in which Cities Service holds a substantial interest. Capacity of the present Sour Lake station will be increased and seven 120,000-barrel floating roof tanks will be installed. Cities Service is also looping the Cimarron Station-Cushing line to receive Scurry County and other West Texas crudes from the Basin pipe line system at Cushing for delivery to Ponca City, Okla.

Forms Foreign Subsidiary

The Fluor Corp., Ltd., of Los Angeles has completed the formation of a wholly-owned foreign subsidiary to do construction work in foreign countries, it was announced by D. W. Darnell, Fluor's president. Offices will be located at 16A Avenue Central, Panama City, R. P., and Dhahran, Saudi Arabia. The new subsidiary, Middle East Fluor, S.A., began operations in Saudi Arabia on Jan. 1, under contracts that have been signed with the Arabian American Oil Co. The Arabian American job will probably take from three to five years to complete.

J. S. Fluor, executive vice-president of the Fluor Corp., who will also serve as president of Middle East Fluor, S.A., said that all stock of the new company, which was incorporated under laws of the Republic of Panama, will be held by the parent company.

Other officers and directors of the subsidiary include J. P. Wiseman, executive vice-president and director; J. P. Kneubuhl, vice-president; J. E. Winn, vice-president and director; F. M. Stephens, secretary-treasurer; N. B. Culp, assistant secretary-treasurer; F. E. Fischer, assistant secretary-treasurer; and J. F. Gardner, director.

H. J. Hagn

J. H. Robinson

H. J. Hagn Heads Chiksan

H. J. Hagn has been elected president and a director of Chiksan to succeed W. Edgar Spear, who becomes chairman. J. H. Robinson has been elected a vice president of Chiksan and general manager of Well Equipment Manufacturing Corp. Mr. Hagn was general manager of Well Equipment Manufacturing Corp. in Houston. He will move to Chiksan's main plant in Brea, California.

Completes Sulfur Plant

Phillips Chemical Co. began operation of its sulfur extraction plant in West Texas at the end of February. This plant, located in the Permian Basin oil fields near Goldsmith, Texas, is designed to extract from natural gas nearly 125 tons of sulfur per day. The product is trucked in its molten state to Fort Worth for conversion to sulfuric acid for subsequent manufacture into ammonium sulfate at the company's plant near Houston, Texas. Phillips Chemical also is building in Crane county in West Texas a second plant designed to produce over 20 tons of sulfur per day, and is formulating plans for the erection of additional plants in the near future.

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Rail, road, canal and sea routes provide unrivalled communications.

Entrance lock 875 ft. long and 100 ft. wide.

Pipe-lines link dockside with adjoining 375-acre industrial estate, where sites are available on lease.

Picture shows the self-contained Oil Dock at

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PRACTICAL OIL GEOLOGY—Dorsey Hager	$ 7.50
PRACTICE OF LUBRICATION—T. G. Thomsen	$ 8.00
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Oil Field Development"	$ 8.00
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Oil Field Exploitation"	$ 8.00
PETROLEUM PRODUCTION ENGINEERING—L. C. Uren "Petroleum Production Economics"	$ 7.50
PETROLEUM REFINERY ENGINEERING—N. L. Nelson	$ 9.00
PETROLEUM PRODUCTION (5 Volumes)—Park J. Jones Vol. I—Mechanics of Production: Oil, Condensate and Natural Gas, 1946	$ 5.00
Vol. II—The Optimum Rate of Production, 1946	$ 5.00
Vol. III—Oil Production by Water, 1947	$ 5.50
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PRINCIPLES OF PETROLEUM GEOLOGY—Wm. L. Russell	$ 7.00
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THE SCIENCE OF PETROLEUM, Vol. 5, Pt. 1, Crude Oils—Benjamin T. Brooks and A. E. Dunston	$11.00
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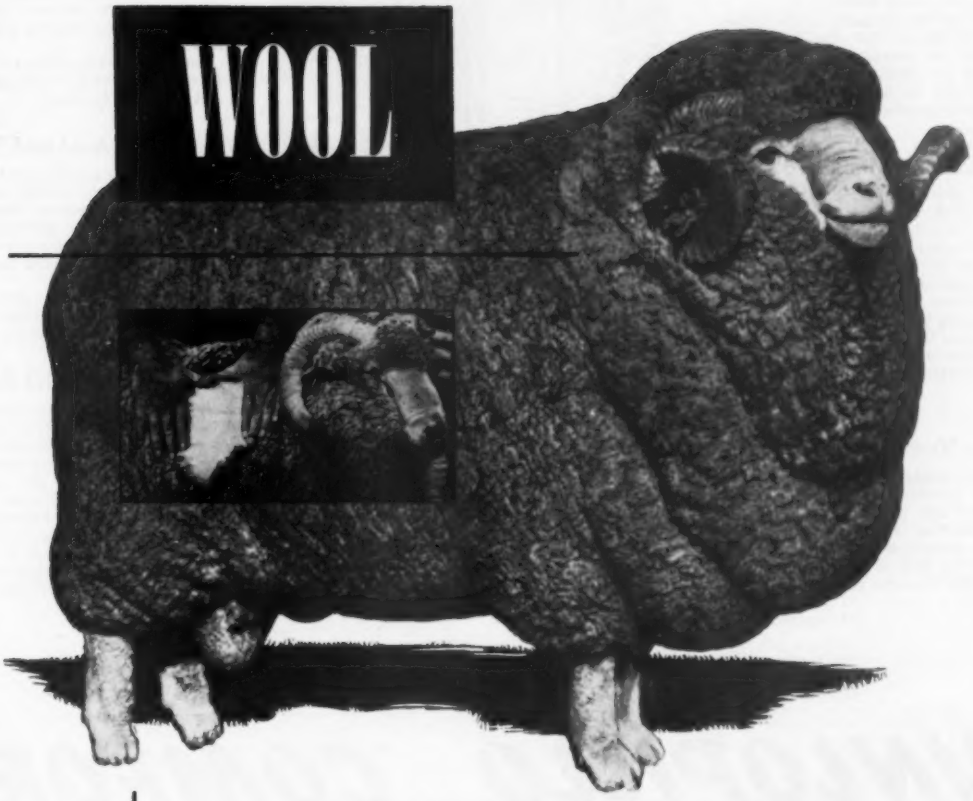

wealth of the Commonwealth

Throughout the world
WOOL means **warmth**...
protection and
comfort for
man, woman, child.

And, throughout the world,
AUSTRALIAN WOOL
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soft, fleecy, **quality** wool.

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112-million sheep
today provide
1 out of every 4 pounds
of the world's supply...
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of all the top-quality
Merino wool.

Wool is **one-third**
of Australia's
total export trade...
accounts for **one-tenth**
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Another mighty important
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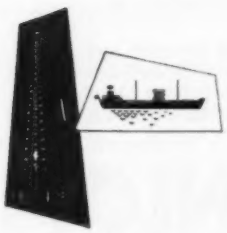
The petroleum products
which have aided
industrial expansion...
which give power,
light, warmth...
which fuel and lubricate
all manner of
modern transport.

More than a **billion**
imperial gallons
of oil products
each year
are the **life-blood**
in the arteries of
the Australian Commonwealth...
are helping to build
a stronger nation...
a better way of life
for the Australian people.

In Australia, as elsewhere
in the Eastern Hemisphere,
people know
they can depend on
the Stanvac organization
to supply this vital oil.



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SOUTH PACIFIC ISLANDS • SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA

To Build Gasoline Plant

Cities Service Oil Co. (Del.) will build a natural gasoline plant near Blackwell, Okla., capable of producing approximately 200,000 gallons of total liquids daily. The plant will produce isobutane, natural gasoline, and LPGas, with completion expected by early 1953.

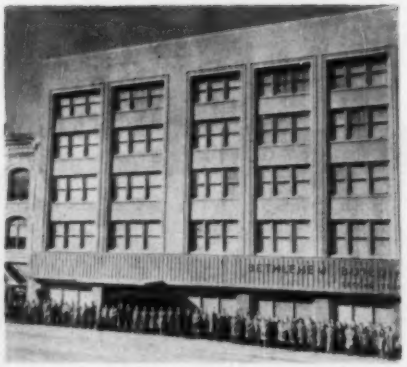
A pipe line will deliver products to the Cities Service refinery at Ponca City. The company's tank car fleet will be increased by about 250 high-pressure cars to facilitate movement of the LPGas production to underground storage locations and other distribution points.

New Ditching Machine

Crutcher-Rolfs-Cummings, Inc. has announced the Middle Incher ditching machine, a companion to the Big-Incher which C-R-C introduced in 1949. The Middle-Incher is the first pipe line ditching machine of its size to utilize hydraulic power to replace gear and sprocket drives. The speed of the conveyor works independently of the speed of the digging wheel. A torque-converter drive insures an even flow of power to the digging wheel regardless of digging conditions encountered. An illustrated brochure will be sent on request.

Finance New Gas Line

Texas Gas Transmission Corp. has completed arrangements for financing its proposed 400-mile, 26-inch natural gas pipe line project from Louisiana to Louisville, Ky. The pipe line, planned for 1952 construction, is designed to move 240 million cubic feet of natural gas from the Southwest to Mid-Western and Appalachian markets.



Bethlehem Supply Co. recently remodeled and redecorated its general office building at Tulsa. Formal opening of the modernized first floor was held during the annual meeting of Bethlehem managers early in February. Photograph shows the managers in front of the building.

Heads Export Sales

John A. Porteous has been appointed director of sales of United States Rubber Export Co., Ltd., to succeed H. J. Korkegi, who has been named regional director, Far East. Mr. Porteous was associated with Dominion Rubber Company, Ltd., Canada, for 26 years. At the time of his appointment he was general manager of the export division of Dominion Rubber Co. He is a native of Canada. William J. Mulvihill, Jr., was made sales manager of home office sales, and John T. Kuntz manager of sales development.

Orders Two Supertankers

Sun Oil Co. has contracted with Sun Shipbuilding & Dry Dock Co. for the construction of two more supertankers of 30,000 dwt each, bringing to four the number of tankers of this type on order by Sun. Capacity of each is approximately 250,000 barrels. Construction is under way on the two tankers ordered by Sun Oil Co. last year.

Sun Shipbulding plans to increase its personnel from the present 4,500 employees to approximately 6,000 by June.

New Acid and Poly Plants

Gulf Oil Corp. will build a new sulfuric acid plant and a polymerization plant at the Port Arthur, Texas refinery. The new acid plant will have a capacity of 300 tons per day and will increase the acid-making capacity of the refinery by 150 percent. Leonard Construction Co. is contractor.

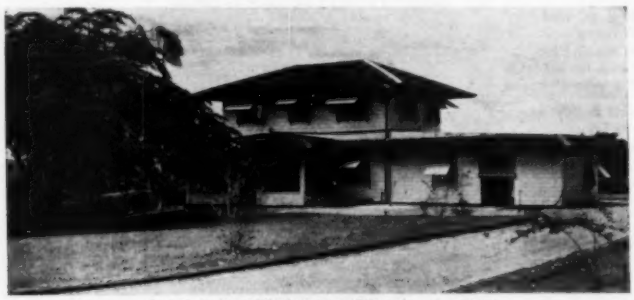
The new phosphoric acid polymerization plant will make gasoline blending stock and detergents. Bechtel Corp. is contractor.

Lummus To Build Sunray Refinery

Sunray Oil Corp. has signed a contract with The Lummus Co. of New York and Houston for construction of a 28,000 barrel refinery at Corpus Christi, Texas. Preliminary construction has begun at the plant site seven miles west of Corpus Christi where Sunray operates deep water terminal facilities in connection with its coastal pipe line company operations. The project is scheduled for completion in the late summer of 1953. The plant will include a UOP fluid catalytic cracking unit, and UOP alkylation and catalytic polymerization plants.

DUNLOPILLO COMFORT

FOR TRINIDAD OILMEN



One of the beautifully-designed staff bungalows for which Dunlopillo mattresses and seat cushioning have been supplied.

Dunlopillo mattresses are used in this air-conditioned hospital, built for the Senior Staff of Trinidad Leaseholds Ltd.

Many hundreds of mattresses and chair cushions have been supplied to Trinidad Leaseholds Ltd. for their Pointe à Pierre Staff Bungalows and Hospital.

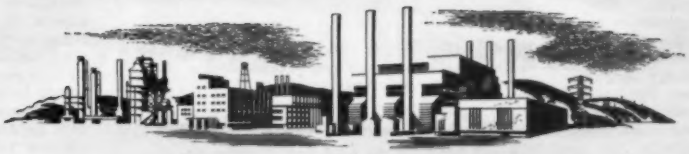
In 1947 Trinidad Leaseholds Ltd., one of the largest oil producers in the British Commonwealth, ordered a trial shipment of Dunlopillo mattresses for use in their staff quarters at Pointe à Pierre. A year later a further order was placed and subsequently regular shipments have been maintained to complete the equipment of the Senior Staff quarters, thus indicating this great Company's satisfaction with Dunlopillo comfort, economy and suitability for tropical conditions.

Dunlopillo chair-comfort, too.
Dunlopillo was also chosen for the cushions and back-squabs of the popular open-frame arm-chairs which are part of the comfortable furnishings provided for the Staff Bungalows on this attractive estate.

DUNLOPILLO

Dunlop Rubber Co. Ltd. (Dunlopillo Division), Walton, Liverpool, 9 and at 77 Kings Road, London, S.W.3

FOUNDERS OF THE LATEX FOAM INDUSTRY



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Book Review

Magic Oil, Servant of the World, by Alfred M. Leeston; published 1951 by Juan Pablos Books; 237 pages; $3.75. Obtainable through World Petroleum Book Department.

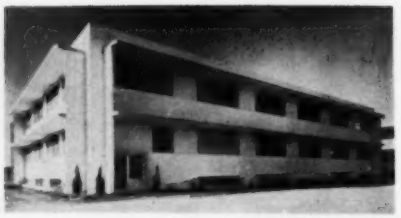
This book has two objectives: to prove what the American system of free enterprise can accomplish, and to show how the accomplishments of the American Oil Industry have influenced successful operation in other countries. How American enterprise developed the petroleum resources of the United States occupies the first 72 pages. The rest of the book gives a lively picture of how modern petroleum technology, largely grounded on principles and practices developed in the United States, has helped other nations develop the oil resources which they could not exploit with their own means and skills.

Crown and Traveling Blocks

BIW Type "PN" Traveling Blocks and BIW Type "KN" Crown Blocks are described factually and briefly in a new folder offered by Beaumont Iron Works Co. Advantages of new design, capacities, and dimensions are shown. The narrow width traveling block is especially valuable in deep hole drilling, and the crown block can be hoisted through the water table in one piece.

Manual On Steam Traps Published

Spirax Manufacturing Co., Cheltenham, has published a manual on the installation, use, and care of steam traps of all kinds, which covers almost every kind of steam trapping installation, and should form a most useful reference book for plant engineers, draftsmen, foremen and pipe fitters. It can be obtained free by application to the company.



View of the recently completed engineering and drafting offices at Fluor Corporation's East Los Angeles plant.

New Fluor Corporation Buildings

Fluor Corporation, East Los Angeles, has just completed a new $400,000 building to house its engineering and drafting offices. All of the walls for the building were precast of light weight concrete on an auxiliary casting platform and then lifted into place. Columns were poured between the exterior wall panels as integral parts of the structural frame. The precast concrete walls were troweled to a smooth finish before raising and were painted after they were put into place. An average light level of 50 foot-candles is maintained at desk height throughout the offices, due to visual requirements in drafting and engineering work.

On April 4 the company will open its new office building at Houston, observing at the same time the elevation of the former Mid-Continent Gas-Gasoline department to the status of a division of the company. Manager Ernest Moncrief has been appointed vice president in charge of the new Mid-Continent division.

The new building provides offices for 125 engineers, process men, accountants, and purchasing agents, as well as drafting and print rooms. Additional features include complete air conditioning, parking for customer cars in front and for employees in the rear of the structure.

Book Review

Oil Shale and Cannel Coal, Vol. 2, edited by George Sell and published 1951 by Institute of Petroleum, London, W.1; 830 pages, 245 illustrations; 63 shillings.

This fat book contains the record of the Second Oil Shale and Cannel Coal Conference held in 1950 in Glasgow, Scotland. The 49 papers presented at the conference are printed in full, with summaries of the discussions that followed. All aspects of oil shale and shale oil are covered—mining, retorting, refining, utilization, and evaluation. Extensive reports are given by various authors on oil shale operations in Australia, Germany, England, Scotland, Sicily, South Africa, Sweden, and the United States. No contributions were received from behind the Iron Curtain. Considering the detail with which operations and equipment in the various regions are described, the publishers are perhaps justified in claiming that for many years this book will remain the standard work of reference on the subject.

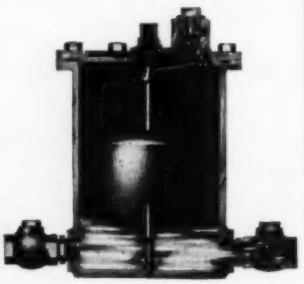
New IMO Pump

A new De Laval-IMO A313B pump, which saves up to 40 percent in initial cost over other IMO models for similar pressures, has been announced in Bulletin L313B by De Laval Steam Turbine Co. It is designed for a wide variety of oil handling applications for pressures up to 275 psi.

Nordberg Diesel Bulletin

Bulletin 194, published by the Nordberg Manufacturing Co., Milwaukee, describes one, two, and three cylinder Type 4FS diesel engines. Separate sections of particular interest to the oil industry are devoted to the use of the engines in generator, power take-off, and pumping applications.

AUTOMATIC PUMP for lifting liquids and oils



This automatic pump combines the good qualities of a pressure pump and a vacuum trap. Pumps hot condensate from low-pressure or vacuum vessels and lifts up to fifty feet or more; pumps boiling, cold or gaseous fluids (including oils); pumps petrol, benzine, dye liquors and alkaline liquors such as caustic, ammonia, etc.; drains sump holes, pits, excavations (where it may be fully submerged). Stops when there is no more liquid to pump; restarts automatically when liquid again flows into it. *Details of the 'Ogden' Pump (in five sizes) from:* SPIRAX MANUFACTURING CO. LTD., (Petroleum Dept.) Charlton House, Cheltenham, Eng.

BOOKS

PRACTICAL ACCOUNTING FOR OIL PRODUCERS—Robert William Pritcher	$ 9.50
ALKYLATION OF ALKANES—Gustav Egloff & George Hulla	$22.50
AMERICAN OIL OPERATIONS ABROAD—Leonard Fanning	$ 5.00
CORROSION HANDBOOK—Herbert H. Uhlig	$12.00
CHEMISTRY OF PETROLEUM DERIVATIVES—Carleton Ellis Vol. I	$20.00
Vol. II	$22.50
CONVERSION OF PETROLEUM—A. N. Sachanen	$12.00
CHEMICAL REFINING OF PETROLEUM—V. Kalichevsky & Stagner	$ 8.25
CHEMICAL ENGINEERS' HANDBOOK—John H. Perry (revised 3rd edition, 1950)	$17.00
CORROSION (Causes and Preventions)—Frank N. Speller	$10.00
THE CHEMICAL PROCESS INDUSTRIES—R. N. Shreve	$ 9.00
CHEMICAL ENGINEERING ECONOMICS—C. Tyler	$ 4.50
CHEMICAL ENGINEERING PLANT DESIGN—F. Vibrandt	$ 7.00
CHEMICAL TECHNOLOGY OF PETROLEUM—Cruse and Stevens	$ 8.50
DISRUPTED STRATA—M. H. Haddock	$ 4.25
DISTILLATION—Interscience Publishers, Inc.	$14.00
ELEMENTS OF FRACTIONAL DISTILLATION—Robinson & Gilliland (4th Edition)	$ 7.50
EMULSIONS & FOAMS—Berkman & Egloff	$12.00
ELECTRICAL ENGINEERING—E. E. Kemberley	$ 5.25
THE FISCHER TROPSCH AND RELATED SYNTHESES—H. H. Storch, N. Golumbic and R. B. Anderson	$ 9.00
ELEMENTS OF OIL RESERVOIR ENGINEERING—Sylvain J. Pirson	$ 7.50

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Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20
DM-2	2¼% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2¼ Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

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Timken's RSQ—Research, Supply, Quality—can solve your tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Extensive testing is one reason for Timken's leadership in high temperature steels. Photo above shows carbon determination test.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Youngstown Advertising Award

Freedom Foundation of Valley Forge, Pa., has awarded The Youngstown Sheet & Tube Co. gold medals for the second year in succession for the company's national advertising program and its employee magazine *The Bulletin.*

The Youngstown advertising program included a number of ads seeking to preserve America by pointing to dangers which the country faces. "Let us prove this prophet false" was based on the writings of Lenin, father of Russian Communism, who said "we shall force the United States to spend itself into destruction." The ad advocated the elimination of all non-essential federal expenses; providing taxes to pay all obligations as we go, and paying off some of the national debt each year.

The Bulletin is in its 33rd year as an employee magazine and has a circulation of more than 34,000 copies per month. During the year it carried many articles, including "Higher National Debt Lowers Dollar Value," "American Survival is at Stake," "Communism, Socialism, Failed in U. S.," "England's Experience Warns U. S.," "Production Eliminates Fear of Want," "Planting for the Future," and many stories showing how company profits are being used to build new facilities for future job security of employees.

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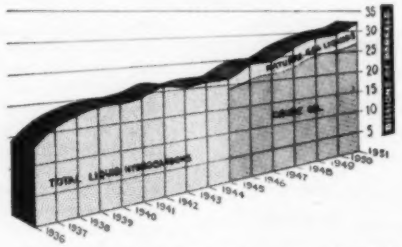
Oil and Gas Reserves Rise

Proved reserves of crude petroleum, natural gas liquids and natural gas in the United States increased to record levels during 1951 as a result of the active drilling campaign carried on by the oil and gas industry. Wells drilled in 1951 totaled 44,500, of which 26,500 found oil or gas. Estimates of reserves were compiled by committees of the American Petroleum Institute and of the American Gas Association.

Crude oil reserves increased 2,199 million barrels, natural gas liquids 456 million barrels and natural gas 8,219 million cubic feet.



At the close of the year, crude reserves totaled 27,468 million barrels, natural gas liquids 4,725 million barrels and natural gas 193,812 million cubic feet.

Extensions of oil fields and revisions of previous estimates based on improvements in production techniques accounted for 4,025 million barrels of crude compared with new pool and new field discoveries totaling 398 million barrels. The same situation was apparent in the case of natural gas liquids. Changes due to field extensions and revisions added 648 million barrels to reserves and new discoveries 75 million barrels.

Most of the new crude and natural gas liquids added to reserves in 1951 was in Texas. Of the total increase in crude reserves, 1,733 million barrels or 79 percent was in Texas. In the case of natural gas liquids, Texas reserves grew 381 million barrels or 83.5 percent of the nation's total increase.

Wyoming reported the second largest increase in crude reserves, 132 million barrels; Louisiana 99.6 million barrels; Illinois 82 million barrels; and Oklahoma 79.5 million barrels. Ten producing states registered losses, the largest being Michigan, with a decrease in reserves of 14.6 million barrels, and Colorado 14.4 million barrels.

The 1951 balance sheet for oil and gas as compiled by the committee follows:

CRUDE OIL	Millions of Barrels
Reserves Dec. 31, 1950	25,268
Plus revisions	1,776
Plus pool extensions	2,249
Plus new discoveries	389
Less 1951 Production	2,214
Total reserves Dec. 31, 1951	27,468
Increase in 1951	2,200

NATURAL GAS LIQUIDS	
Reserves Dec. 31,1950	4,268
Plus revisions	648
Plus discoveries	75
Less 1951 production	267
Total reserves Dec. 31, 1951	4,725
Increase in 1951	457

NATURAL GAS	Millions of Cubic Feet
Reserves Dec. 31,1950	185,593
Plus extensions & revisions	13,014
Plus new discoveries	3,039
Plus stored gas	133
Less 1951 production	7,967
Total reserves Dec. 31, 1951	193,812

Dr. Frank H. Lahee of Sun Oil Co. is general chairman of the API reserves committee which prepared the report. N. C. McGowen of United Gas Corp. is chairman of the American Gas Association reserves committee.

Pipelaying with International Harvester Equipment

An illustrated 12 page folder, "International Power Can Do More Pipelaying for Your Money," recently released by the International Harvester Export Co., contains seventeen pictorial case histories with IH crawlers at work under a variety of conditions.

Also included in the folder is a tipping load capacity chart for the five Superior-Cardwell pipe booms specifically designed for use with IH crawlers. These pipe booms have a lifting capacity range of 14,000 to 90,000 pounds at a 4-foot overhang. The folder, E-12-B, is available through International Harvester distributors.

Lane-Wells Expands Industrial Relations

Ralph G. Grant is now personnel manager for the Lane-Wells Co. at Los Angeles. He supervises head office personnel activities and assists the industrial relations manager.

Lane-Wells has also established industrial relations departments in its Gulf Coast and Mid-Continent divisions. Cecil R. Searcy will be divisional industrial relations manager at Houston and Emmett C. Doane at Oklahoma City.

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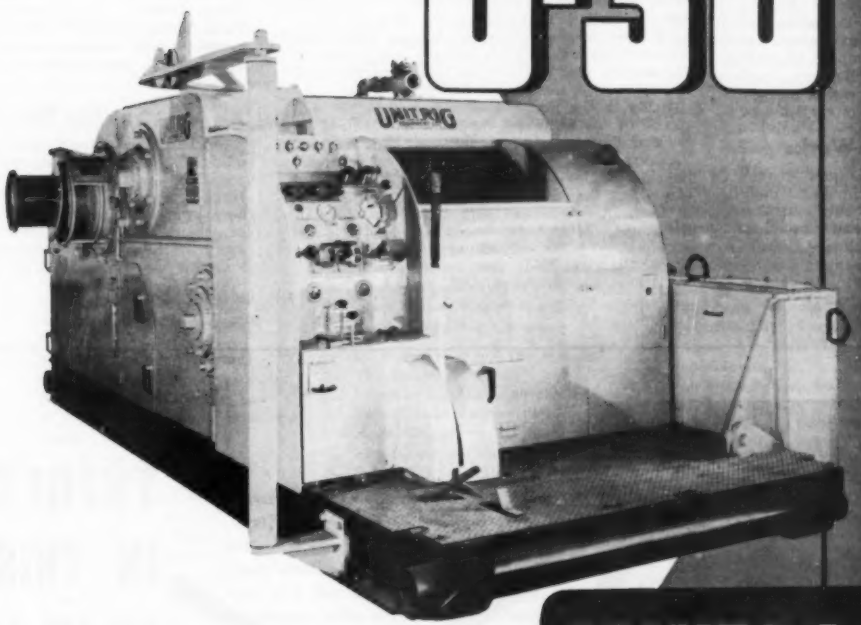

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New Halliburton Division

Halliburton Oil Well Cementing Co. has divided its former Midland, Texas division into two parts. A new division headquarters has been established at Lubbock with offices in the Lubbock National Bank Building. C. T. McGuire is manager of the new division and his assistant is J. L. Muse, formerly of Midland.

The former Midland division will continue to have its headquarters at that point. W. L. Hughes has been transferred from Houston to Midland to become assistant division manager.

Other recent Halliburton transfers announced by Vice President L. B. Meaders are: Elmer Lawrence, from Great Bend, Ka., as assistant division manager of Evansville division; A. O. White, from Flora, Ill. to Great Bend, Ka., as assistant division manager of Wichita division; J. B. Jones, from San Antonio to Houston, Texas, as contact man; W. A. Wallace, from Houston, Texas, to Duncan, Okla., as formation testing supervisor.

El Dorado Refining to Build Cracker

A $3 million expansion program is being undertaken by El Dorado Refining Co., El Dorado, Kans. The program will involve an increase in crude capacity, installation of a cat cracker and gas recovery plant, and the revamping of other facilities such as the poly unit. Refinery Engineering Co., Tulsa, will build the cracker and gas recovery plant and do the poly revamp job.

Joins Beaumont Iron Works

C. P. Gillespie, Houma, La., is new district manager for sales of Beaumont Iron Works drilling and producing equipment in Louisiana, Mississippi, and Arkansas. He has had more than 35 years experience in the oil business with major oil companies and equipment manufacturers.

Lion Plant Enlargement

Lion Oil Co. has begun a $5 million expansion program at its refinery in El Dorado, Ark. New process units will include a 5,000-barrel fluid catalytic cracking unit with integral vapor recovery equipment and a 1,150-barrel sulfuric acid alkylation plant. Two steam generators, a 16,000 gallon per minute water cooling tower, tankage and other various auxiliaries will be installed to serve the enlarged process capacity.

Aluminum Stearate Booklet

American Cyanamid Company's Chemicals Division has published a booklet for grease manufacturers describing three new grades of Cyanamid aluminum stearates. The three grades have similar physical and chemical properties, but differ sharply in gelling strength.

Honors Senator Bermudez

Senator Antonio J. Bermudez, director general of Petroleos Mexicanos, was the guest of honor at a luncheon tendered him by John B. O'Connor, executive vice-president of Dresser Industries, Inc., in Dallas, Texas March 3. Mr. O'Connor, as a close personal friend of Senator Bermudez, arranged the affair in his honor to pay tribute to the senator and at the same time have the leading oil men of the United States meet him.

Pride in the progress of his own nation and praise of the U. S. oil industry were voiced by Senator Bermudez in his address at the luncheon. "Mexico has one of the world's brightest futures," he said. "Mexico has become industrialized to the extent that it is today your No. 1 customer in Latin America, and your No. 3 customer in the world. Mexico purchased and paid for approximately $700 million of goods from the United States in 1951. We expect to become your No. 1 customer in the world."

P. L. Myers C. W. Fleetwood

Hughes Promotes Myers and Fleetwood

Hughes Tool Co. has created a new division by combining the northern part of the West Texas and the Wichita Falls districts. Park L. Myers, formerly manager of the Ark-La-Tex division, has been promoted to manage the new "North Texas Division" with headquarters in Wichita Falls, Texas. Clyde W. Fleetwood has been promoted to the managership of the Ark-La-Tex division with headquarters in Shreveport, Louisiana.

Sinclair Buys Stoll

Sinclair Oil Corp. has purchased Stoll Oil Refining Co., Louisville, Ky., and will operate it in the future as a marketing subsidiary. Ernest L. Hughes, Sinclair marketing vice president, has been elected chairman of Stoll. Charles Stoll is president. Purchase of the company marks the entry of Sinclair into Kentucky as a marketer. Products will be brought to Stoll terminals by the Sinclair river fleet.

This unusual photograph of storage tanks typifies the qualities of "International" paints; the products for the petroleum industry are unusually good. But this standard did not just happen; it was reached after pursuing a policy of producing the right paint for the purpose. For instance, among other products used throughout the industry "International" makes special paints for the protection and decoration of drums.

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The Koch Engineering Co.
Koppers Company, Inc.

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The Oil and Gas Journal
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O. L. Olsen Company
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Superior Mfg. Company

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Taylor Instrument Companies
Tellepsen Const. Co.
Tri-State Mfg. & Engr. Co., Inc.
Tube Turns, Inc.

Union Asbestos & Rubber Co.
Union Steam Pump Sales Co.
United Centrifugal Pumps

Vinson Supply Company
Vulcan Steel Tank Corp.

Walco Engr. & Const. Co.
Walworth Company
Westcott and Greis, Inc.
Western Supply Company
The Wickes Boiler Company
Wilkening Mfg. Co.
Woobank Machinery Company
World Petroleum
Worthington Pump & Machinery Corp.
Wyatt Metal and Boiler Works

Young Sales Corporation

John Zink Burner Company

W. Plasch C. R. Edgecomb, Jr.

Schlumberger Expands in California

F. G. Taves, area manager of Schlumberger Well Surveying Corp., Los Angeles, has announced the formation of two new divisions in the Pacific coast area. A. H. Curran, Jr., and F. L. Bryan have been appointed division managers.

Mr. Curran has been appointed coast division manager with headquarters in Los Angeles and district offices in Ventura, Long Beach, and Santa Maria. District managers in his division are: C. R. Edgecomb, Jr., Ventura; G. C. Hepburn, Jr., Long Beach; and Will Plasch, Santa Maria.

Mr. Bryan has been put in charge as manager of the newly created valley division with offices at Bakersfield. The valley division is comprised of districts with offices located at Coalinga, Taft, King City, Sacramento, and Bakersfield, with C. F. Gallagher manager at Coalinga; Armour Kane, Taft; D. G. Swiers, King City; C. B. Evans, Sacramento; and J. H. Gallois, Bakersfield.

HUGH R. ALLBEE has been appointed assistant director of industrial relations for Sun Oil Co. Mr. Allbee, a veteran of two decades of Sun Oil service, formerly was manager of the company's Boston marketing district.

Yugoslavia Expands Oil Operations

Commerce Survey, organ of the Yugoslav Trade Agency, announces that in the first half of 1951, Yugoslavia doubled its exports of petroleum products. In 1950 Yugoslavia exported to west Germany over 3,000 tons of petroleum, to Italy 10 tons of gas oil and 23,000 tons of fuel oil. West Germany and Austria received five tons of highest grade (96 percent) benzene.

The 1951 quota in the Five-Year Plan was 450,000 tons of crude oil and 75,000 tons of gasoline. Before 1939, Yugoslav annual production was only 1,000 tons of crude and (refining of) 4,000 tons of gasoline. In comparison with 1945, Yugoslav crude production for 1950 increased 379 percent.

Completion of the key plants of basic industry in 1952 and 1953 in Yugoslavia will raise the amount of crude processed 54 percent above the 1950 level, the National Planning Commission announces. The new lube plant at Rijeka began operations in January 1952. Yugoslav refineries now supply about 90 percent of domestic demand.

Romanian Gas Production

The great shortage of solid fuels has caused the Romanian government to step up natural gas production for Bucharest to double the 1945 figure. Production goal is 204 percent of that of 1950, which will necessitate the investment of an estimated 12 million lei.

Book Review

Analysis of Canadian Crude Oils, by H. McD. Chantler, P. B. Seely, and F. E. Goodspeed; published by Dept. of Mines, Ottawa, Canada (1950); 90 pages, $.50.

Analysis of 88 samples of crude oils collected during the period 1931-1950 from 40 fields in six provinces are given, and the approximate characteristics of these oils are described.

Wins Horning Award

The Society of Automotive Engineers has awarded Daniel L. Pastell of the Du Pont Company's petroleum laboratory staff the 1950 Horning Memorial Award. It is given annually to the author of the best paper on the adaptation of fuels to internal combustion engines. Mr. Pastell's paper "Pre-combustion Reactions in a Motored Engine," was presented at the 1950 SAE summer meeting.

Lane-Wells Celebrates 20th Birthday

Lane-Wells, pioneer in gun perforating service, celebrated its 20th birthday on March 19. In 1940 Lane-Wells introduced radioactivity well logging, a service that identified formations in either cased or uncased holes and permitted operators for the first time to locate potential producing zones back of well casing.

According to Rodney S. Durkee, president, Lane-Wells has completed more than 165,000 gun perforation jobs and more than 40,000 radioactivity well logs. The company now has more than 1,400 employees in the field, shops, offices, and laboratories in the 78 branches maintained by the company in the United States, Canada, and Venezuela. At the birthday celebration, Walter T. Wells, a co-founder of the company and now chairman, received the first 20-year service award.

W. T. Wells R. S. Durkee

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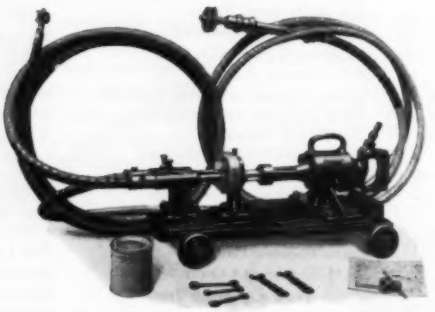

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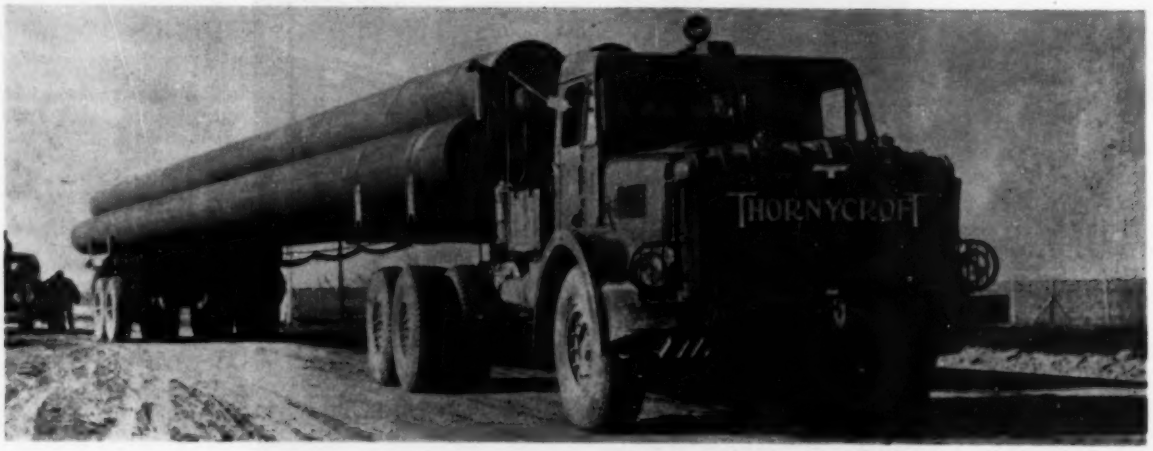

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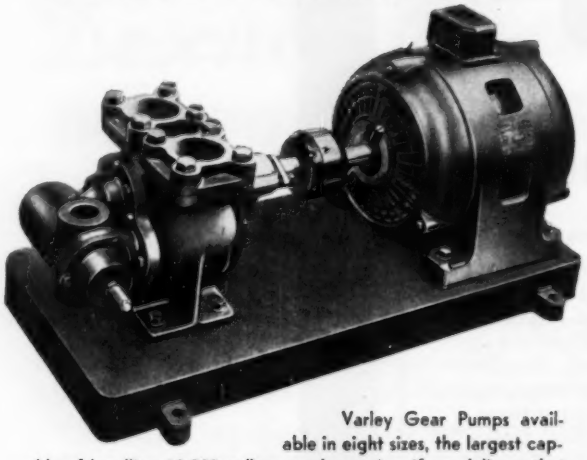

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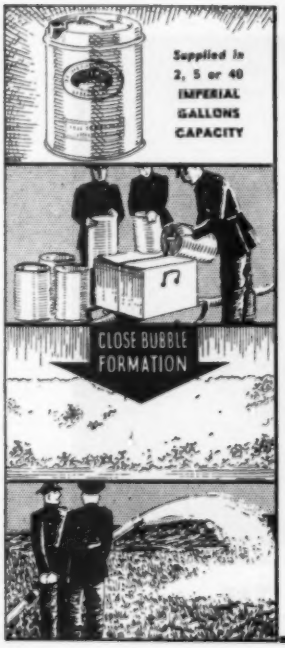

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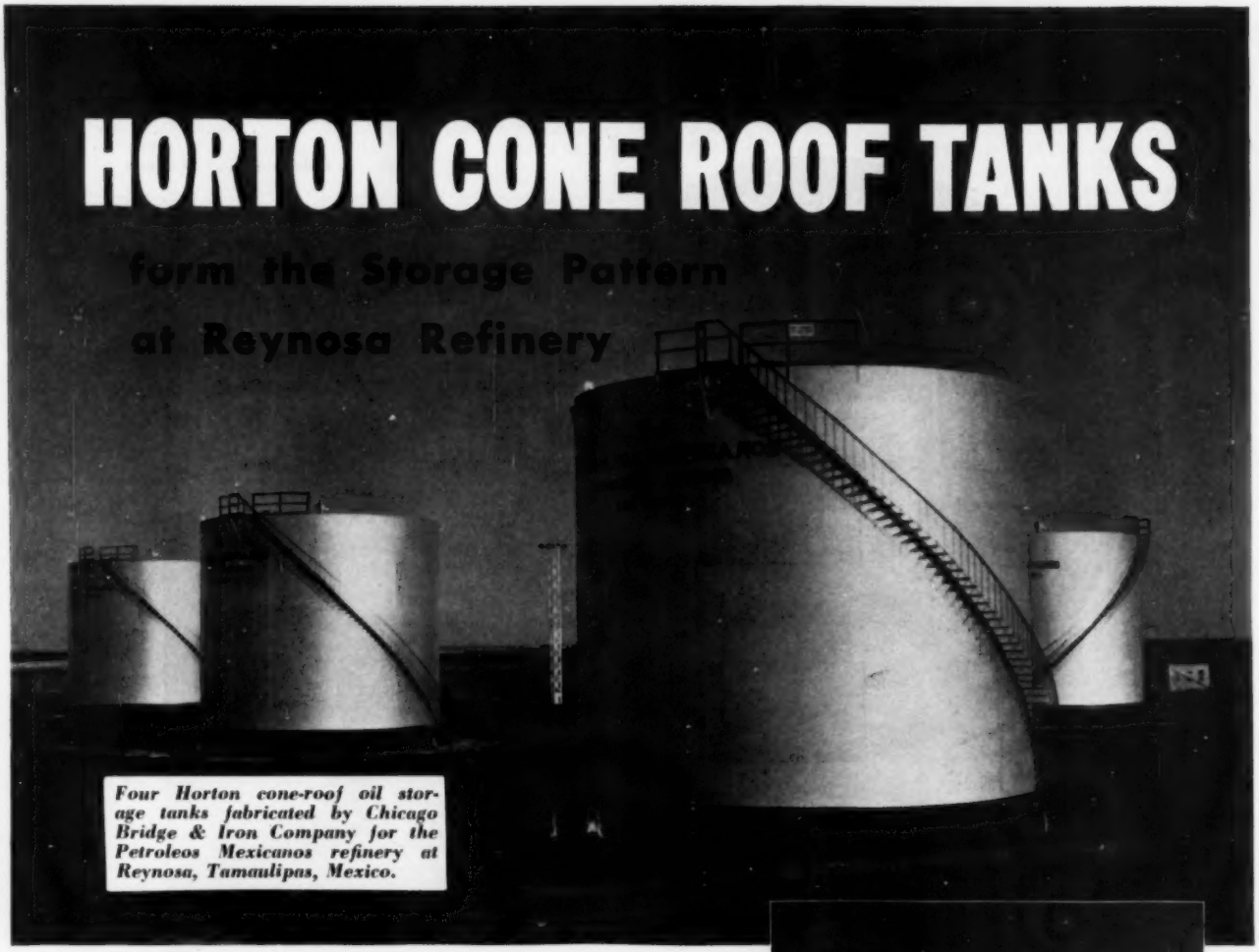
form the Storage Pattern at Reynosa Refinery



Four Horton cone-roof oil storage tanks fabricated by Chicago Bridge & Iron Company for the Petroleos Mexicanos refinery at Reynosa, Tamaulipas, Mexico.

ACROSS the Rio Grande River from the United States is Petroleos Mexicano's 4,000-bbl. Reynosa refinery. It was built to serve the growing northeast section of Mexico with valuable petroleum products necessary to both agriculture and industry.

The Horton cone-roof tanks shown in the accompanying pictures are used for oil storage at the Reynosa refinery. They are furnished with butt-welded shells and lap welded roofs and bottoms to assure long, efficient service. In addition, the steel plates for the tanks were pickled and painted by the Phoscote Process to reduce maintenance. This exclusive Chicago Bridge & Iron Company process removes mill scale from the metal and leaves a coating of iron phosphate on the surface, forming an excellent bond for the prime coat of paint.

These cone-roof tanks at the Reynosa refinery are representative of the many Horton tanks — Hortonspheres — Hortonspheroids — Horton Floating Roof tanks — in service at other Pemex refineries at Poza Rica, Atzcapotzalco, and Salamanca.

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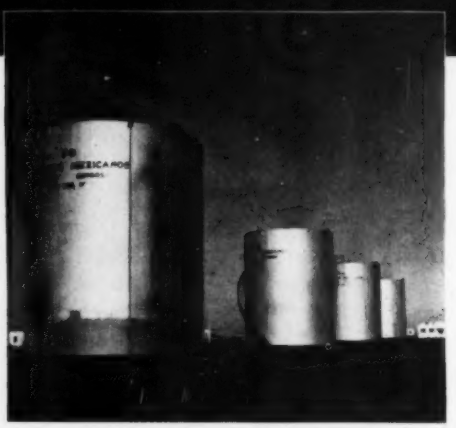
Complete details on Horton tanks may be obtained by writing our nearest office. There is no obligation on your part.



Four Horton cone-roof tanks fabricated by Chicago Bridge & Iron Company for the Pemex refinery. On structures of this type, a cone-roof with a ¾" to 12" pitch is furnished unless otherwise specified. They may also be equipped with umbrella Hortondome or Horton Floating Roofs.

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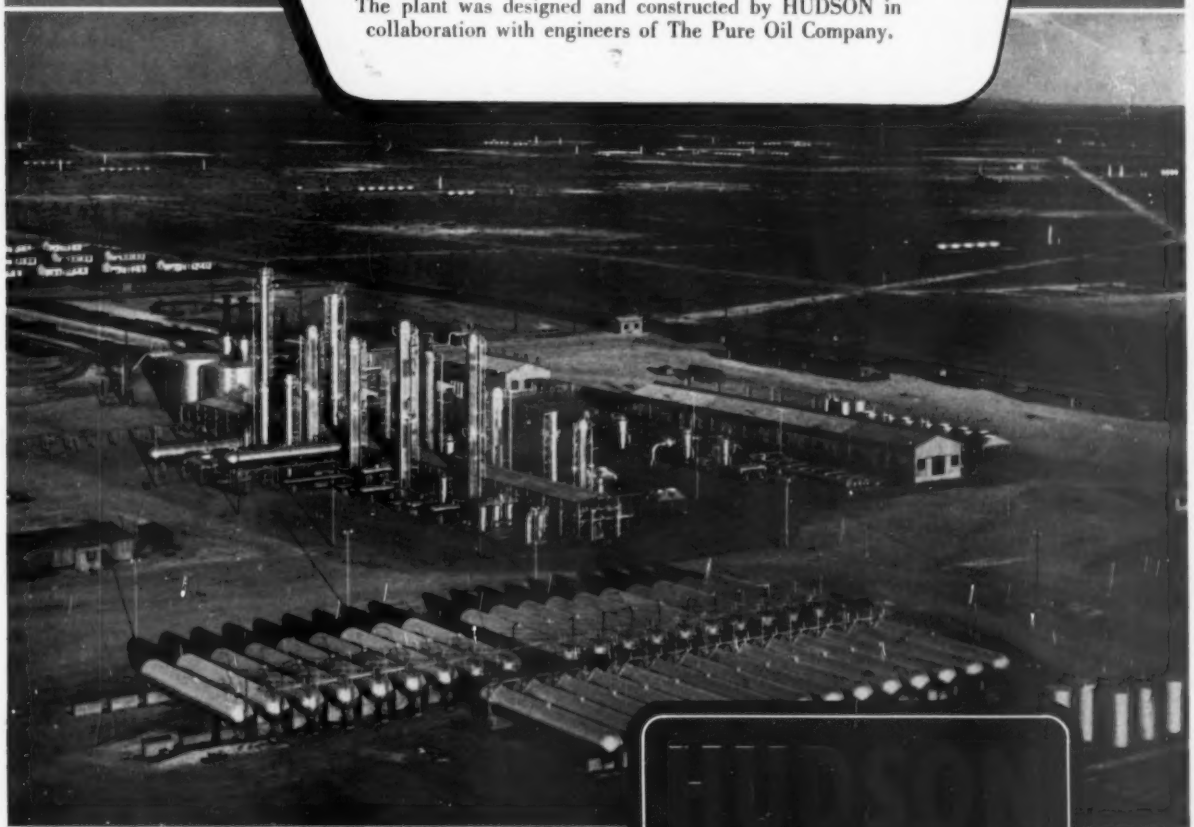

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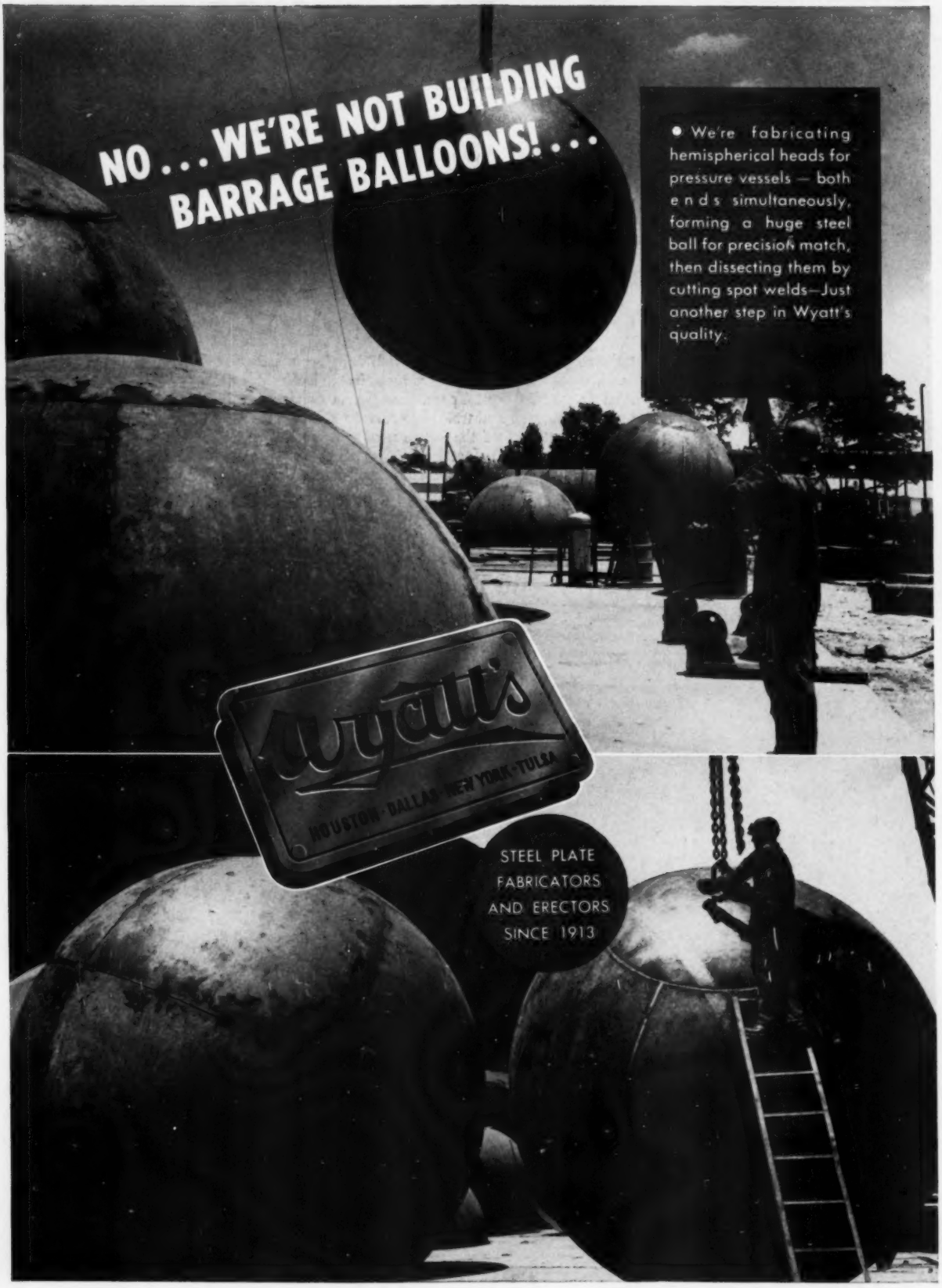
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